

Multi-Channel System

MCS-08

Technical Manual



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1. SAFETY INSTRUCTIONS



CAUTION READ this manual BEFORE operating or servicing this equipment. FOLLOW these instructions carefully. SAVE this manual for future reference. DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment. ALWAYS DISCONNECT this equipment from the power source before cleaning or performing maintenance. CALL FLINTEC ENGINEERING for parts, information, and service.



WARNING ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.



WARNING FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.



WARNING DISCONNECT ALL POWER TO THIS UNIT BEFORE REMOVING THE FUSE OR SERVICING.



WARNING BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT OR BODILY HARM.



CAUTION OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

2. DECLARATION OF CONFORMITY



EG-Konformitätserklärung EC-Declaration of Conformity

Monat/Jahr: *month/year*: 06/2010
Hersteller: *Manufacturer*: Flintec GmbH
Anschrift: *Address*: Bemannsbruch 9
D-74909 Meckesheim
Deutschland / Germany
Produktbezeichnung: *Product name*: MCS-08 Multi Channel System

Das bezeichnete Produkt stimmt mit folgenden Vorschriften der Europäischen Richtlinien überein:
This product confirms with the following regulations of the Directives of the European Community

Richtlinie 2004/108/EG des Europäischen Parlaments und des Rates vom 15. Dezember 2004 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit und zur Aufhebung der Richtlinie 89/336/EWG

Directive 2004/108/EC of the European Parliament and of the Council of 15th December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC

Richtlinie 2006/95/EG Niederspannungs-Richtlinie

Directive 2006/95/EC Low Voltage Directive

Die Absicherung aller produktspezifischen Qualitätsmerkmale erfolgt auf Basis eines zertifizierten Qualitätsmanagement-Systems nach DIN ISO 9001.

All product-related features are assured by a quality system in accordance with ISO 9001.

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften.

This declaration certifies the conformity with the listed directives, but it is no promise of characteristics.

Folgende Normen werden zum Nachweis der Übereinstimmung mit den Richtlinien eingehalten:
As a proof of conformity with the directives following standards are fulfilled:

EN 61326-1	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen (IEC 61326-1:2005) <i>Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements (IEC 61326-1:2005)</i>
EN 60950-1	Einrichtungen der Informationstechnik - Sicherheit - Teil 1: Allgemeine Anforderungen (IEC 60950-1:2005, modifiziert); <i>Information technology equipment - Safety - Part 1: General requirements (IEC 60950-1:2005 modified)</i>


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Geschäftsführer / General Manager




i.V. Felix von Hertling
Technischer Leiter / Technical Director

3. INTRODUCTION

3.1. Overview

Type MCS-08 is a powerful and economic state-of-the-art multi channel system for static and dynamic weighing applications plus force and torque measurements.

The basic measurement module is the 1-channel type MCS-08AD A/D converter which converts the analogue low level signal from a load cell or a strain gauge sensor to a digital high-resolution and high-accuracy signal.

All standard weighing functions are available on this A/D converter.

For bus connections, gateways such as Profibus DP, ProfiNet, Modbus RTU and Ethernet TCP/IP are available. The gateway can communicate via the internal system bus (named N-bus) with up to 8 type MCS-08AD A/D converters.

For local display purposes the internal system bus can be extended with one optional type MCS-08DP Display module. The system can be extended with optional control signals located on the type MCS-08IO Digital I/O module. The gateway can communicate via the internal system bus with up to eight type MCS-08IO modules.

The type MCS-08 Multi-Channel System comprises various hardware modules which are

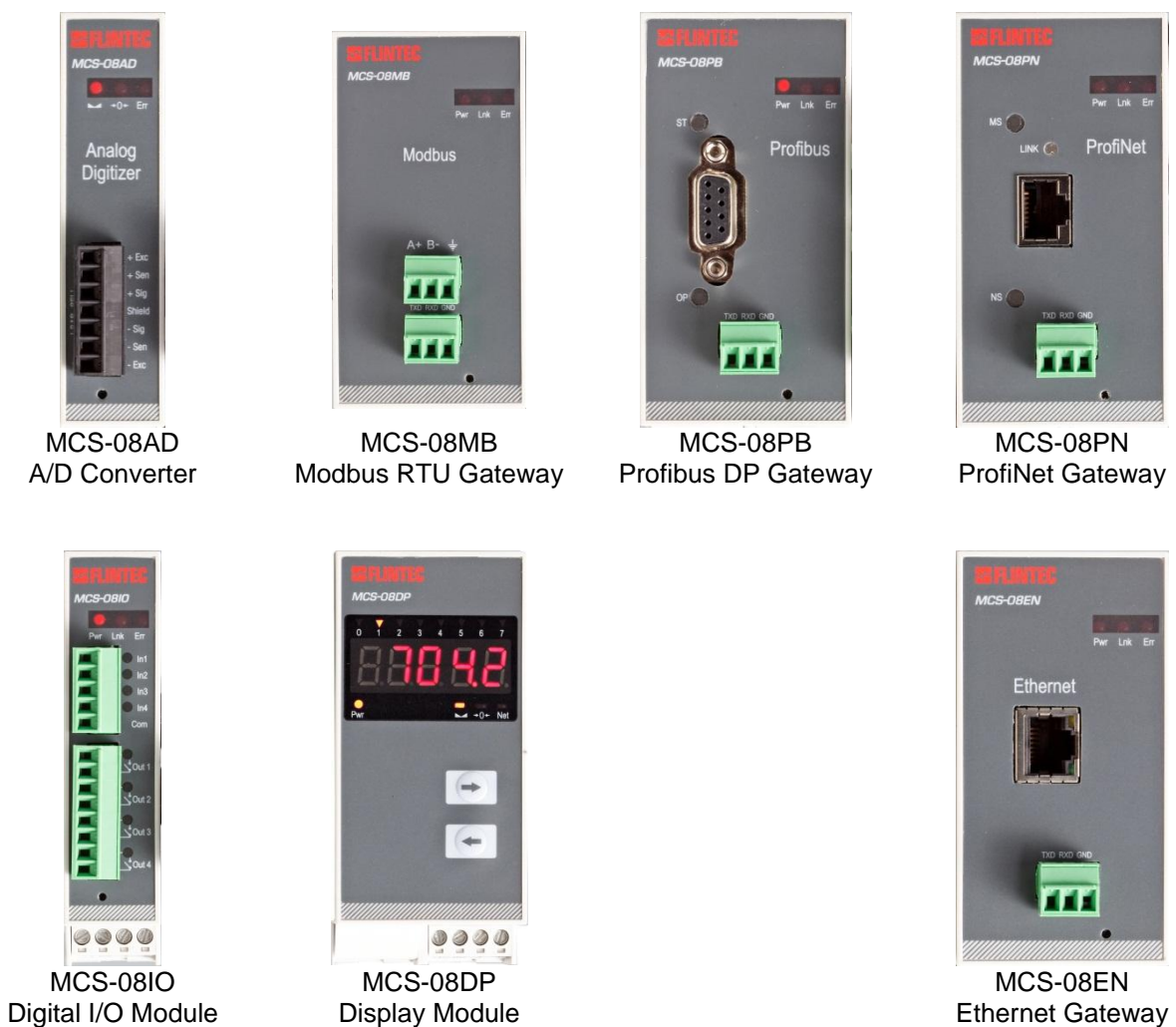


Figure 3.1 – MCS-08 hardware modules



Figure 3.2 – MCS-08 bus system

A basic configuration of type MCS-08 Mult Channel System is shown in Figure 3.2. In this configuration the gateway module is the master of the internal N-bus and it simultaneously acts as a slave for the external bus. The gateway connects the external network with the locally installed MCS-08 hardware modules and transmits commands and responses to and from the external bus. It scans all hardware modules for their status and then transmits this status information continuously to the external bus controller.

3.2. Specifications

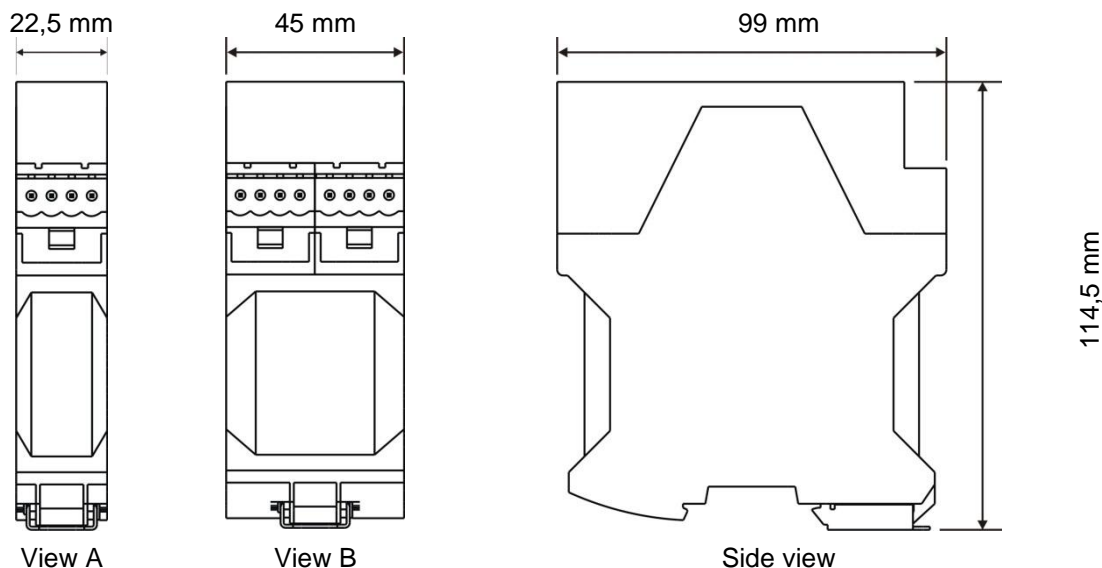
1-channel A/D Converter: Type MCS-08AD	
A/D Converter	
Type	24-bit Delta-Sigma ratiometric with integral analogue and digital filter
Analogue input range	0 mV to 18 mV (unipolar) or -18 mV to +18 mV (bipolar), switchable
Linearity	< 0.0015 % FS
Temperature coefficient	< 2 ppm/°C
Min. input sensitivity	0.1 µV/d
Conversion rate	Up to 800 measurement values per second
Internal resolution	Up to 8 million counts
External resolution	Up to 100000 counts (weight value, force, torque) respective 1 million raw counts (unipolar) respective 2 million raw counts (bipolar)
Calibration and Weighing Functions:	
Calibration	Electronic calibration without test weights (eCal) or calibration by test weights
Digital filter	10 step adjustable digital adaptive filter
Weighing functions	Tare, zero, auto zero tracking, motion detection, auto-zero at power-up, save tare at power-off, increased resolution
Load cells:	
Excitation:	5 V DC at 58...1200 Ω, max. 100 mA
Number of load cells:	Up to 6 load cells à 350 Ω or 18 load cells à 1100 Ω in parallel
Connection:	4- or 6-wire technique, cable length 250 m/mm² for 6-wire connection
Communication and Setup:	
Setup & calibration	By PC software via gateway module, backup data stored on PC
Response time	< 4 ms (delay after each read or write command)
Power supply:	
DC power supply	10 to 28 VDC, < 200 mA, not galvanically isolated
Environment and Enclosure:	
Operating temperature	Between -10 °C and +40 °C at maximum 85% RH, non-condensing
Enclosure & protection class	Polyamide, for DIN-rail mounting, protection class IP20
Dimensions & weight	99 x 22.5 x 114.5 mm (L x W x H), weighs approx. 100 g

Gateway Modules	
General	
Internal bus system	Communication with up to 8x type MCS-08AD and up to 8x type MCS-08IO and 1x type MCS-08DP
Serial interface RS232C	9600 baud (8, N, 1), used as service interface, communication to each connected type MCS-08AD respective
Response time	< 4 ms (delay after each read or write command)
Power supply:	
DC power supply	10 to 28 VDC, < 100 mA, not galvanically isolated
Environment and Enclosure:	
Operating temperature	Between -10 °C and +40 °C at maximum 85% RH, non-condensing
Enclosure & protection class	Polyamide, for DIN-rail mounting, protection class IP20
Dimensions & weight	99 x 45 x 114.5 mm (L x W x H), weighs appr. 150 g
Profibus DP Gateway Module: Type MCS-08PB	
Communication:	
Profibus DP-V0 + DP-V1	9.6 kbit/s to 12 Mbit/s (automatic), galvanically isolated interface
Address range	1...126
ProfiNet Gateway Module: Type MCS-08PN	
Communication:	
ProfiNet	100 Mbit/s (full duplex), galvanically isolated interface
IP settings	DHCP or manual setup by PC software
Modbus RTU Gateway Module: Type MCS-08MB	
Communication:	
Serial interface RS485A	Serial interface RS485, 1200 to 57600 baud (8N1, 7E1, 7O1), bus capability up to 31 units
Address range	1...31
Ethernet TCP/IP Gateway Module: Type MCS-08EN	
Communication:	
Ethernet TCP/IP	10 Mbit/s (full duplex), galvanically isolated interface
IP settings	Manual setup by PC software
Other	Web client interface
Digital I/O Module: Type MCS-08IO	
Digital I/O:	
Inputs	4 opto-isolated inputs (12...30 V DC)
Outputs	4 potential-free NO relays, 1A @ 250 V AC, 30 V DC
Input function	Control input to communication interface
Output function	Control output from communication interface
Communication and Setup:	
Setup & calibration	By PC software via gateway module, backup data stored on PC
Response time	< 4 ms (delay after each read or write command)
Power supply:	
DC power supply	10 to 28 VDC, < 100 mA, not galvanically isolated
Environment and Enclosure:	
Operating temperature	Between -10 °C and +40 °C at maximum 85% RH, non-condensing
Enclosure & protection class	Polyamide, for DIN-rail mounting, protection class IP20
Dimensions & weight	99 x 22.5 x 114.5 mm (L x W x H), weighs appr. 100 g

Display Module: Type MCS-08DP	
Local Display:	
Display	LED red, 10.2 mm high, 5 digits, with overflow indication
Status LEDs	Selected channel; net, no motion, zero and power-on state of the selected channel
Keyboard	2-key membrane with tactile feedback
Refresh time	250 ms
Power supply:	
DC power supply	10 to 28 VDC, < 100 mA, not galvanically isolated
Environment and Enclosure:	
Operating temperature	Between -10 °C and +40 °C at maximum 85% RH, non-condensing
Enclosure & protection class	Polyamide, for DIN-rail mounting, protection class IP20
Dimensions & weight	99 x 45 x 114.5 mm (L x W x H), weighs appr. 140 g

3.3. Housing

MCS-08 modules come within a polyamide housing sealed to IP20. They are prepared for mounting on NS 37/7 or NS 35/15 standard DIN rails (see drawings).



View A: MCS-08AD, MCS-08IO

View B: MCS-08PB, MCS-08PN, MCS-08MB, MCS-08EN

Figure 3.3 – Dimensions

3.4. Accessories

Accessories supplied with the modules

The following accessories are supplied together with the modules.
If any part is missing, please contact your supplier.

	MCS-08AD	MCS-08IO	MCS-08DP	MCS-08PB	MCS-08PN	MCS-08MB	MCS-08EN
4-pin and 5 mm pitch plug, light gray, power connector	1	1	1	1	1	1	1
5-pin and 3.81 mm pitch plug, light gray, N-bus connector	1	1	2	2	2	2	2
3-pin and 3.81 mm pitch plug, green, RS232C or RS485				1	1	2	1
7-pin and 3.81 mm pitch plug, black, for load cell cable	1						
5-pin and 3.81 mm pitch plug, green, for digital inputs		1					
8-pin and 3.81 mm pitch plug, green, for digital outputs		1					
Installation CD (xFace software, technical documentation)				1	1	1	1

Table 3.1 – Accessories supplied with instrument

Accessories sold separately

The following accessories are available from Flintec.

	MCS-08AD	MCS-08IO	MCS-08DP	MCS-08PB	MCS-08PN	MCS-08MB	MCS-08EN
RS-232C cable (3 m long) for connection with PC				1	1	1	1
Junction box for load cell connection	Refer to Flintec catalog						
Open end load cell cable, 6 wire (0.22 cm ² each)	Max. 200 meter length						

Table 3.2 – Accessories supplied separately

4. INSTALLATION

PRECAUTION: Please read this manual carefully before you install the instrument. If you apply all recommendations in this chapter you will increase the reliability and long term performance of your system.

4.1. Recommendations

4.1.1. Control Cabinet Design

Warning: Please follow the following warnings for designing the control cabinet which will increase the reliability of your system.

The control cabinet should be designed therefor the MCS-08AD modules can operate safely. The panel should be placed in a clean area, without getting direct sun light if possible, with a temperature between -10 °C and +40 °C, humidity not exceeding 85% non-condensing. All external cables should be installed safely to avoid mechanical damages.

MCS-08 modules are very low level signal measuring instruments. To avoid electrical noise, the instruments should be separated from equipment that produces electrical noise. Preferably use a metal cabinet against radio frequency interference, to protect against electromagnetic disturbance the cabinet shall be connected to ground. Keep the load cell cable trays separated from others, if possible. If there is noise-generating equipment such as heavy load switches, motor control equipment, inductive loads etc., please be careful against the EMC interference in the cabinet. If possible protect MCS-08 modules by a Faraday cage or install them in a separate section or install them far a way from this kind of equipment. Install parallel reverse diodes to the DC inductive loads like relays, solenoids etc. to minimize voltage peaks on the DC power lines.

4.1.2. Cabling

All cables coming to the control cabinet shall be shielded. Please use separate cable trays for these low signal level cables. Distance from load cell cables, interface cables and DC power supply cables to power line cables shall be 50 cm at minimum.

4.1.3. Mechanical Installation

After designing the control panel and installing DIN rails according to the recommendation in this chapter, install the N-bus connectors on the DIN rail as shown in figure 4.1.

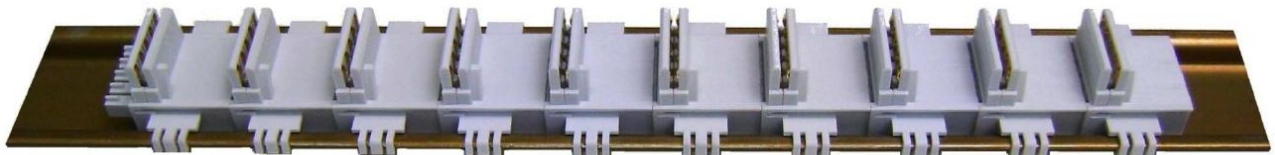


Figure 4.1 – N-bus connectors installed on DIN-rail

Place the modules on the DIN rail for making the connection between the N-bus and the MCS-08 modules as shown on figure 4.2. Be sure that the mechanical installation and the N-Bus connection of the modules are done properly.

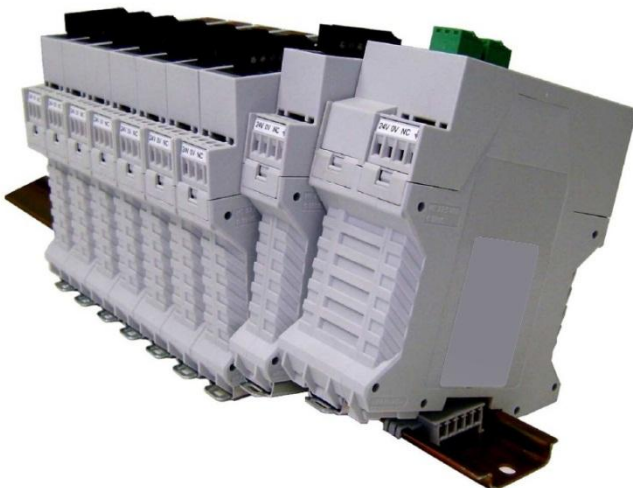


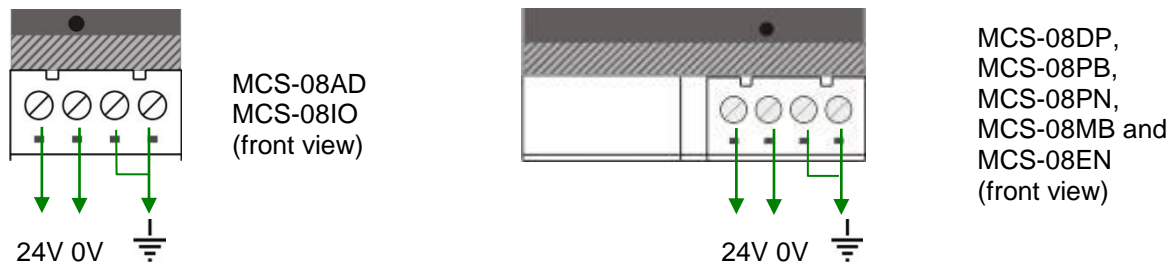
Figure 4.2 – Installation on DIN-rail

4.2. Electrical Connections

Warning: Please always remember that MCS-08AD modules are very low voltage measuring instruments. Your control cabinet design and proper installation increases the reliability and the performance of the instrument. Please do not forget that the instrument must be powered off before inserting or removing any peripheral connector. All required electrical connections should be done as described below.

4.2.1. Power Supply and Grounding

The power supply voltage of the instrument shall be between 12 V DC and 28 V DC. The current consumption of the power supply will be calculated by multiplying 0.2 A and the quantity of instruments. The pin configuration of the 24 V DC power supply connector located at the bottom front of the instrument is shown below in figure 4.3.



Warning: Do not forget to connect the Shield pin to the reference ground.

Figure 4.3 – The pin layout of 24 V DC connector

The quality of the instrument's ground will determine the accuracy and the safety of your measuring system. A proper ground connection is needed to minimize extraneous electrical noise effects on the measurement. A poor ground can result in an unsafe and unstable operation. It is important that the instrument should not share power lines with noise-generating equipment such as heavy load switching, motor control equipments, inductive loads, etc. If the condition of the power line in the plant is poor, prepare a special power line and grounding. Before interfering the instrument, turn off the power and wait at least for 30 seconds.

4.2.2. Load Cell Connection

To avoid damages, the load cell wiring should be made carefully before energizing the instrument. Load cell connection details are shown below in figure 4.4. In 4-wire installations the sense and excitation pins with the same polarity should be short circuited at the connector side. If you have a junction box in your system, use a 6 wire cable between the MCS-08AD moduler and the junction box, and short circuit these pins at junction box for better performance.

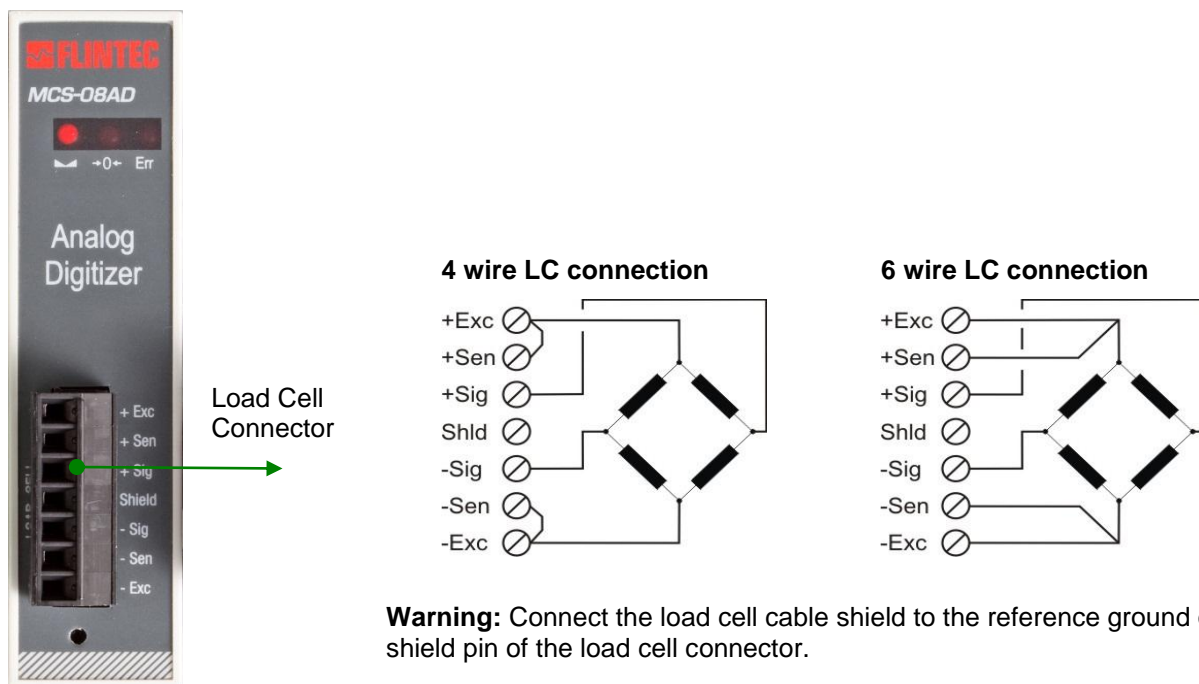


Figure 4.4 – Load cell connection

4.2.3. Digital I/O Connection

MCS-08IO modules have the digital I/O connectors on the module's front. The I/O connection diagram is shown in figure 4.5. The outputs are potential-free contacts (1A @ 250 VAC, 30 V DC) and the inputs are opto-isolated (12...30 V DC).

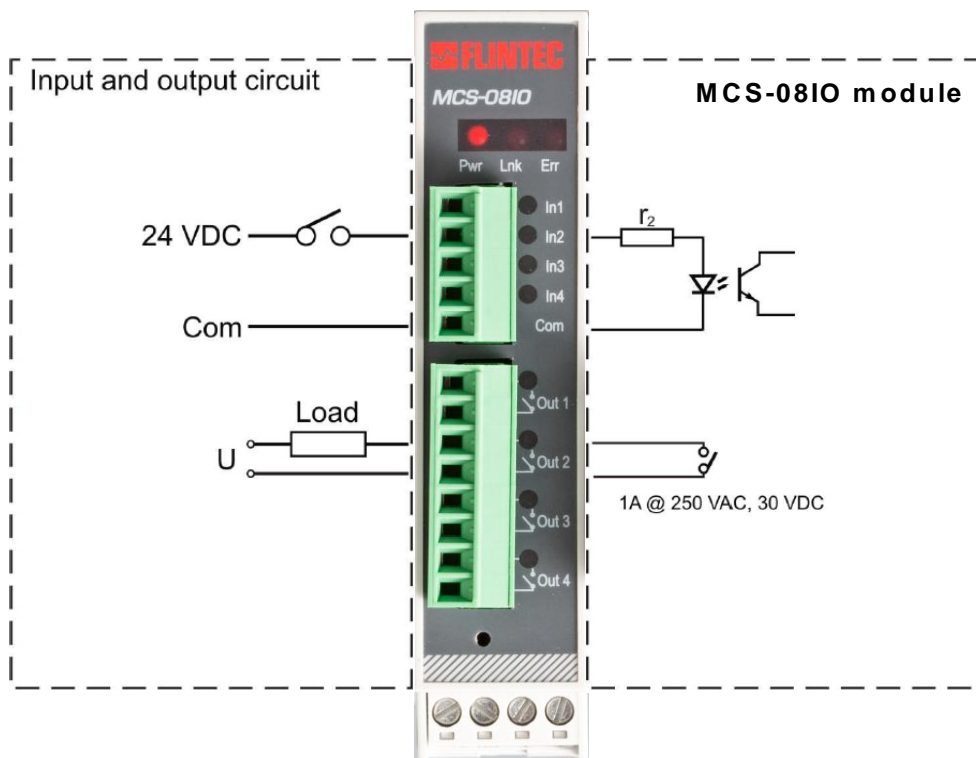


Figure 4.5 – Digital I/O connection

4.2.4. Communication Interfaces

Please refer to the corresponding chapter:

MCS-08MB (Modbus RTU)

see chapter 9.2

MCS-08PB (Profibus)

see chapter 10.2

MCS-08PN (ProfiNet)

see chapter 11.2

MCS-08EN (Ethernet and Modbus TCP)

see chapter 12.2

4.3. Commissioning

PRECAUTION: Please read this manual carefully before energizing the instrument. Perform the commissioning operation according to the procedure given in this chapter. Only trained persons are allowed for cleaning, commissioning, checking and servicing of the instrument. The interference of untrained person may cause some unwanted damages or injuries.

Before energizing the instrument, please make the required mechanical and electrical installations. After power on, you have to setup your MCS-08 system before you can start to use the bus interface.

Install the xFace software onto your PC as described in chapter 5 Setup. The xFace software is used for setup, calibration and testing of MCS-08 systems.

After you have successfully checked the performance of the instrument with xFace, you can begin to use the system in your application.

5. SETUP

PRECAUTION: Please read this manual carefully before energizing the system. Perform the commissioning according the procedure given in chapter 4.3. Only trained person are allowed for commissioning, checking, cleaning and servicing of the instrument. The interference of untrained person may cause some unwanted damages or injures.

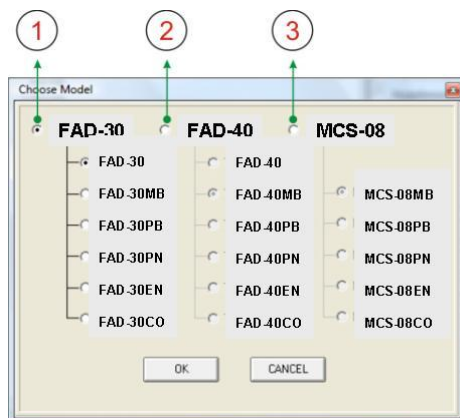
MCS-08 systems are setup and calibrated by the xFace software supplied with the instrument. The instruments shall be setup in the sequence described below before you can use the bus interface.

- Install the xFace software onto your PC
- Connect your PC with the gateway over the serial interface (RS232C respective RS485)
- Set up the N-bus addresses and the gateway module
- Set up and calibrate the A/D Converters
- Check the performance of the A/D Converters
- Check the performance of the Digital I/Os

5.1. Installation of the xFace Software

Please follow following steps to install the xFace software:

- Close all applications on your PC
- Insert the CD that contains the xFace software into the CD-ROM drive
- Double click "Setup.exe" to start the installation. The setup Wizard is displayed.
- Follow the menus in the setup wizard step by step.
- After finishing the installation, the Setup Wizard will inform you about the success of the software installation. Click the OK button.
- After closing the Setup Wizard you can start to use the xFace software.



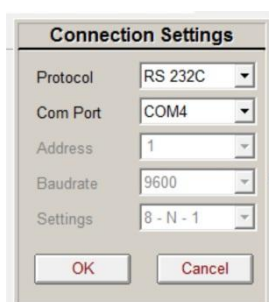
- ① Typ FAD-30
- ② Typ FAD-40
- ③ Typ MCS-08 Select one of the MCS-08 gateways and press OK button.

Figure 5.1 – xFace Type Selector Window

5.2. Connection to the xFace Software

The connection between the MCS-08 gateway module and the xFace software is done via the RS232C service port for all gateway modules. Alternatively Ethernet (for MCS-08EN only) or RS-485 (for MCS-08MB only) can be used for this connection. You can purchase a suitable PC connection cable as an accessory from Flintec (Refer to chapter 3.4.2).

After running the xFace software select the gateway model you use (see figure 5.1.). Select the PC's communication port within the Connection settings menu in the tools tab (see figure 5.2) and click the connect icon. After the communication between the MCS-08 gateway module and your PC has successfully started the traffic light of the connect icon turns from red to green.



Protocol: Select the setup port of the instrument. MCS-08MB modules can be setup over RS485 or RS232C. Other models can be setup over RS232C.

Com Port: Select the communication port of the PC

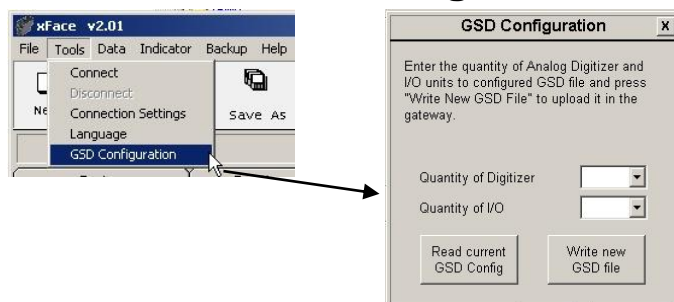
Address: Select the RS-485 address, if RS-485 is selected

Baud rate: Select the RS-485 baud rate, if RS-485 is selected

Setting: Select the RS-485 communication port setting, if RS-485 is selected

Figure 5.2 – xFace Connection Settings

5.3. N-Bus Addressing



First define the number of MCS-08AD modules and MCS-08IO modules in the GSD configuration.

Figure 5.3 – xFace GSD configuration

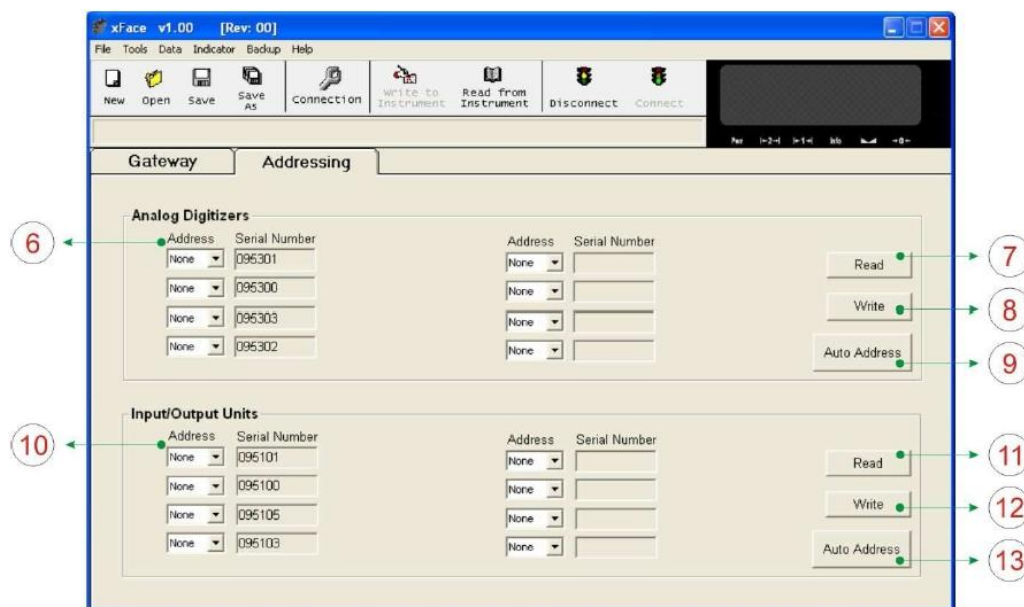


Figure 5.4 – xFace N-bus Addressing Tab



Address: Addresses of the MCS-08AD modules

Read button: Reads the N-address and the serial number of the MCS-08AD module

Write button: Writes the N-address to the MCS-08AD module with the corresponding serial number

Auto Address: Fills the address fields with values 0 to 7

Address: Addresses of the MCS-08IO modules

Read button: Reads the N-address and the serial number of the MCS-08IO module

Write button: Writes the N-address to the MCS-08IO module with the corresponding serial number

Auto Address: Fills the address fields with values 0 to 7

For the first time connection to a MCS-08 system only the gateway and the addressing tabs become active. First address the modules to the N-Bus to activate the modules within the MCS-08 system.

Addressing MCS-08AD modules to the N-Bus: First click the 'Read' button to read the serial numbers and the addresses. Then define an address for each MCS-08AD module within the system. Then click the 'Write' button to save the address settings. If the addressing of the MCS-08AD modules to the N-Bus is successfully completed, then the Setup, the Calibration and the Converter Status tabs as well as the Scale Address and the Visual Weight Display will be activated.

Addressing Input/Output Instruments to N-Bus: First, click the 'Read' button to read serial numbers and the addresses. Then define an address for each MCS-08IO module within the system. Then click the 'Write' button to save the address settings. If the addressing of the MCS-08IO modules to the N-Bus is successfully completed, then the I/O Status tab will be activated.

5.4. Gateway Setup

Depending on their interface structure gateways have an interface parameter which has to be set up **BEFORE** the external communication bus can be started. The gateway setup is done in the gateway tab. Details on the gateway parameters and their descriptions can be found in the corresponding gateway chapter.

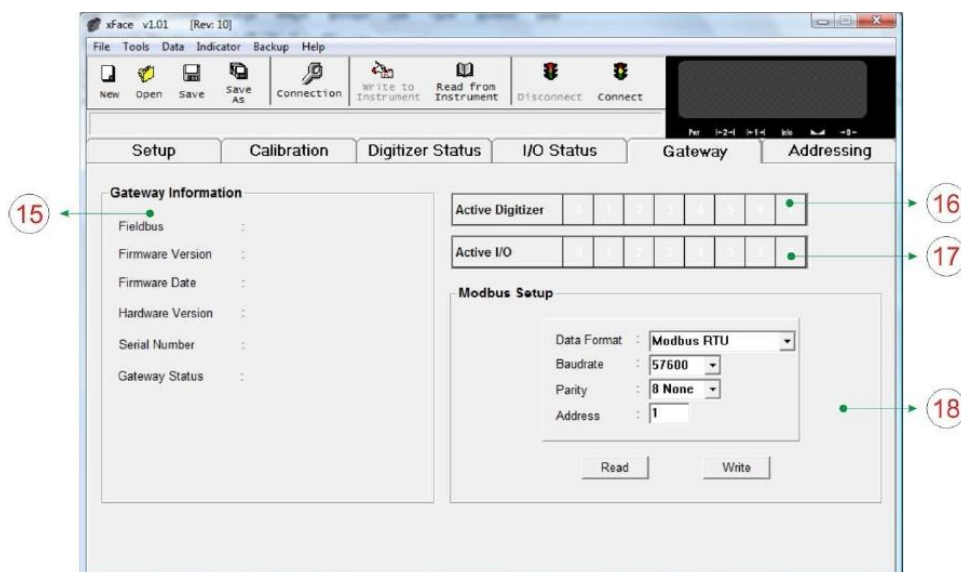


Figure 5.5 – xFace Gateway Tab



Gateway Information: Indicates the bus type, the firmware and hardware version numbers and the serial number of the gateway module

Active A/D Converter: Indicates the active MCS-08AD module and the N-Bus address within the system. For more information refer to chapter 6

Active Digital I/O: Indicates the active MCS-08IO module and the N-Bus address within the system. For more information refer to chapter 8

External Bus Setup: This block allows the user to set up the external bus parameters. Each gateway type has its own parameter set corresponding to the bus type.

5.5. A/D Converter Setup and Calibration

PROPOSAL: Read the chapter about MCS-08AD modules carefully before you set up and calibrate a module. This will increase the performance of your weighing system by applying a proper setup and calibration. When you set up a MCS-08AD module, if there is any within the system, then first select the scale number by pressing the scale selection button.

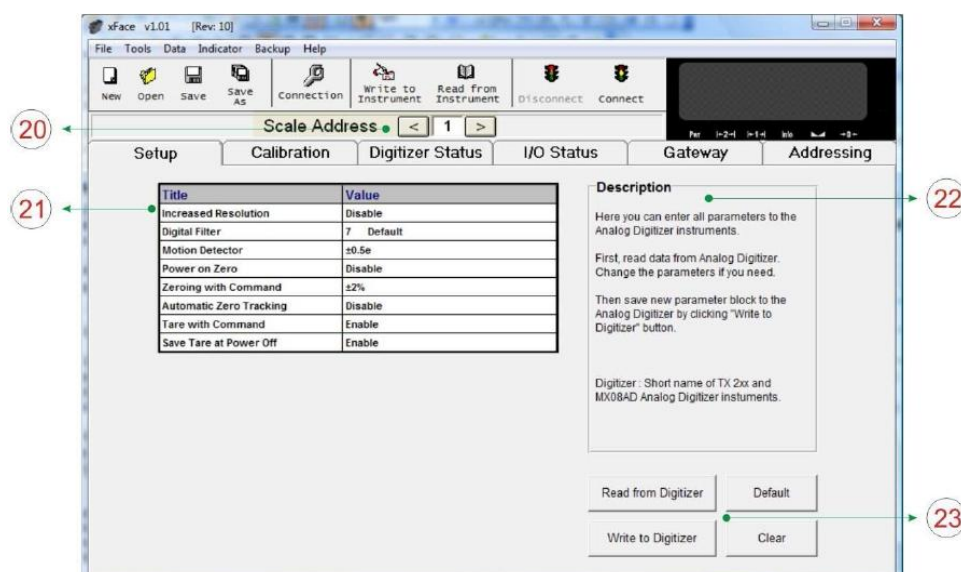


Figure 5.6 – xFace A/D Converter Setup

20

Scale Selection: Click the 'Left' or 'Right' arrow to select the current MCS-08AD module

21

A/D Converter Parameters: This block allows the user to setup the A/D Converter's parameter related to the operation mode. Refer to chapter 5.5.1

22

Description: This block provides some clear-text explanations

23

Read from A/D Converter: Click this button to read the parameter settings from the module

Write to A/D Converter: Click this button to save the parameter settings to the module

Default: Click this button to load the factory default settings

Clear: Empties the parameter settings

For entering the parameter settings go to the setup tab, adjust the parameter values and then write these data to the module. After writing the parameter settings to the module, calibrate the module. You can find the parameter descriptions in the next chapter.

5.5.1. Scale Parameters

In the setup menu the scale parameters can be viewed, changed or saved to the instrument. These parameter settings are:

Increased External Resolution

For service purposes this parameter enables the 10 times higher resolution of the weight value than the defined interval in weighing and force mode. Increased resolution must be disabled for use in normal operation (Not available in Count Mode). Default setting: 'Disable'.

Digital Filter

Environmental noise like bounding forces, air flow, vibration, motor control instruments etc. may disturb the load cell signal. The selection of proper filter settings determines how quickly the system will react to the load cell signal. **Load cell signal digital filtering is done according to this parameter settings. The settings can be changed from 0 (fastest settling) to 9 (slowest settling). Default setting: '7'.

Setting	0	1	2	3	4	5	6	7	8	9
Values/s	1600	800	400	200	100	100	100	50	50	50
Settling time [ms]	80	140	250	180	300	420	380	620	720	1800

Motion Detection

This parameter defines the motion detection window which determines a stable weighing. If motion detection is not required, this parameter can be disabled. The available motion detection window values are:

Weighing and Force Mode:

Disable	$\pm 0.3e$	$\pm 0.5e$ (default setting)	$\pm 1e$	$\pm 2e$
---------	------------	------------------------------	----------	----------

Count Mode:

Disable	± 60	± 100 (default setting)	± 200	± 400
---------	----------	-----------------------------	-----------	-----------

Power On Zero

This parameter enables automatic zeroing after powering on the instrument. The automatic zeroing is only done if the total zero drift from the calibrated zero signal is in the defined zeroing window. This zeroing window will be defined in the percentage of the scale capacity.

Disable (default setting)	$\pm 2\%$	$\pm 10\%$
---------------------------	-----------	------------

To avoid unwanted zeroing at power on this parameter should be disabled or carefully set up in applications like silo weighing, tank weighing and automatic weighing applications. If the weight is not within the power on zeroing range, the instrument is powered on without zeroing (Not available in Count Mode).

Zeroing Range

Zeroing of the scale is performed if the difference between load cell signal value and unloaded load cell signal value at the calibration is in the selected percentage of the scale capacity. Zeroing can be done by zeroing command when the scale is stable. Zeroing can be done by zeroing command when the scale is stable. The available zeroing ranges in the percentage of the scale capacity are:

Disable	$\pm 2\%$ (default setting)	$\pm 20\%$	$\pm 40\%$
---------	-----------------------------	------------	------------

Auto Zero Tracking

AZT automatically re-adjusts the scale to zero for compensating defined small deviations around the center of zero. AZT only works within the defined zeroing range and stops working if this range is left. To avoid unwanted zeroing this parameter should be disabled or carefully set up in applications like silo weighing, tank weighing and automatic weighing applications (Not available in Count Mode). The available AZT window values are;

Disable (default setting)	$\pm 0,5e$	$\pm 1e$	$\pm 3e$
---------------------------	------------	----------	----------

Tare

If this function is enabled, the weight is tared when the tare command is received. Additional conditions for taring are positive gross weight and no motion. Multi-taring is possible (Not available in Count Mode). Default setting: 'Enable'.

Save Tare at Power Off

If this function is enabled, the tare value is stored at power off and the instrument starts up in Net mode at power on (Not available in Count Mode). Default setting: 'Enable'.

5.5.2. Scale Build and Calibration

Scale build, operation mode selection and scale calibration is performed in the calibration tab of xFace as shown in figure 5.7. Please follow the procedure in the sequence as described in the following chapters.

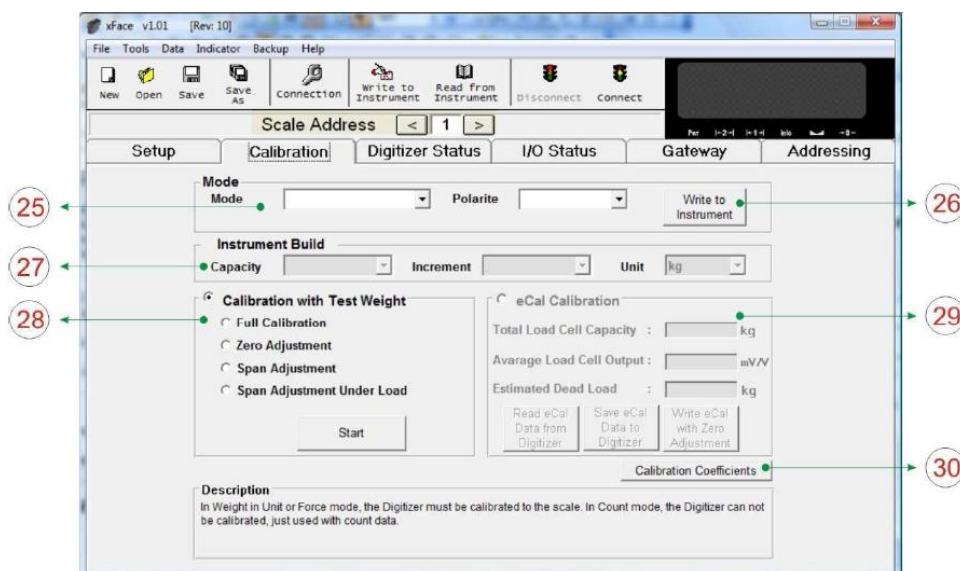


Figure 5.7 – MCS-08AD Setup Parameters

- 25 **Mode:** This block allows the user to select the operation mode and polarity.
- 26 **Write to Instrument:** Click this button to save the operation mode and the polarity.
- 27 **Scale Build:** Here you define the capacity, the increment and the unit of the scale
- 28 **Calibration with Test Weight:** This block allows the user to calibrate with test weights.
- 29 **ECal Calibration:** This block allows the user to calibrate without test weights.
- 30 **Calibration Coefficients:** This function allows the user to restore a calibration if the calibration coefficients have been noted before.

For entering the parameter values enter the setup tab, adjust the parameter settings and then write this data to the A/D Converter. After changing parameter settings the instrument always requires a re-calibration.

Mode selection

MCS-08AD modules have three operation modes which are:

- Count Mode: Filtered and normalized ADC count data will be transmitted in this mode. The calibration is performed at the PLC, if any.

Weighing Mode: Unipolar weight data in calibrated weighing unit will be transmitted. This mode is compatible to OIML R76 and EN 45501.

Force Mode: Bipolar or unipolar force measurement data in calibrated force unit will be transmitted.

Select the scale operation mode and the polarity. Then click the “Write to Instrument” button to save your mode selection. The default calibration of MCS-08AD modules is Count Mode and 10 mV unipolar input signal range. If you select the Count Mode, there is no scale build and instrument calibration. Each MCS-08AD module is adjusted for high accuracy during the production. The MCS-08AD input signal ranges and their external resolutions are shown in Table 5.1.

Input signal range	Input Signal level	Polarity	External resolution
0 to 5 mV -5 to 5 mV	5 mV	Unipolar	1 million counts
		Bipolar	2 million counts
0 to 10 mV -10 to 10 mV	10 mV	Unipolar	1 million counts
		Bipolar	2 million counts
0 to 15 mV -15 to 15 mV	15 mV	Unipolar	1 million counts
		Bipolar	2 million counts
0 to 18 mV -18 to 18 mV	18 mV	Unipolar	1 million counts
		Bipolar	2 million counts

Table 5.1 - Count Mode, Input Signal Ranges and External Resolution

Select the input signal level and polarity for high external resolution. Write your mode selection to the instrument by clicking “Write to Instrument” button. Jump to the chapter 5.6.

Scale Build

The scale capacity, the increment and the unit have to be introduced to the MCS-08AD module before you can perform a calibration in Weighing or Force mode.

Capacity: To select a new value for the scale capacity, click in the text box.

Use the keyboard to enter a new value, or use the drop-down menu.

Increment: Use the drop-down menu to select the increment.

Unit: Select the unit

The scale calibration can be performed by using test weights or by electronic calibration (eCal).

Calibration by Test Weights

This calibration method performs zero and span calibrations using test weights. For accurate calibration the test weight value should not be less than 1/10 of the scale capacity.

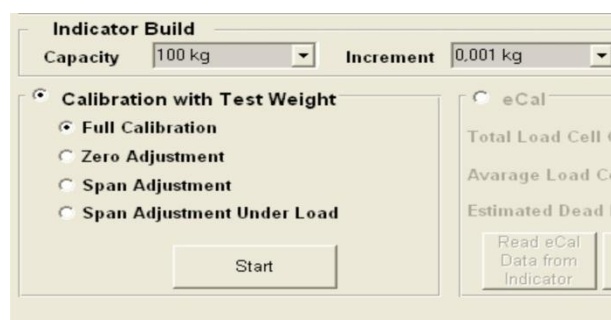


Figure 5.8 – Calibration by test weights

Please note that the scale build values should be entered before you start the calibration.

Select “Full Calibration” for performing a complete scale calibration. Click the “Start” button. Unload the scale for performing the zero calibration and click the “Yes” button. The virtual display will show the [WAIT] message during the zero calibration. During the zero calibration the scale must be stable. Approximately 5 seconds later the span calibration window will be displayed. Load the scale and enter the loaded test weight value, then click the “OK” button. The scale must be stable during the span calibration. Approximately 5 seconds later the new calibration settings are saved automatically.

If any error occurs during the calibration an error message warns you. Click the “Yes” button to reload the previous values or click the “No” button to use the new settings.

You can adjust the zero or the span of your scale without performing a full calibration. Additionally the “span calibration to the unloaded scale” feature is another tool of MCS-08AD modules for after-sale services.

Zero Adjustment

If your scale has a residual zero drift you may perform a zero adjustment only. Select “Zero Adjustment” and press the “Start” button. Then the zero calibration window will be displayed. Unload the scale and click the “OK”

button. The [WAIT] message appears on the virtual display during the zero adjustment. Approximately 5 seconds later the zero adjustment will be finalized.

Note: Zero adjustment is also performed over the bus interface. Refer to the data structure of the related bus interface.

Span Adjustment

If your scale has a span drift, you may perform a span adjustment only. After selecting “Span Adjustment” and pressing the “Start” button, enter the test weight value; place the test weights on the scale and press the “Yes” button. The [WAIT] message appears on the virtual display approximately for 5 seconds while the span calibration is being performed. After finalizing the span adjustment, the instrument will save the span coefficients automatically.

Note: Span adjustment is also performed over the bus interface. Refer to data structure of the related bus interface.

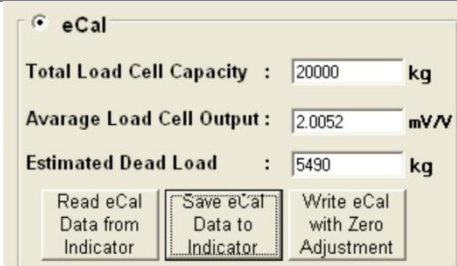
Span Adjustment under Load

This feature is being used to perform a span adjustment without unloading the scale. This operation is especially used for the span adjustment for non-empty tanks to make a span adjustment without emptying the tank. After selecting “Span Adjustment under Load” press the “Start” button. The temporary zeroing message appears on the monitor. This means the instrument will determine the existing load as the temporary zero. If the scale is stable press the “Yes” button. The [WAIT] message appears on the virtual display approximately for 5 seconds to determine the temporary zero. Then the span calibration window will be displayed. Load the scale and enter the loaded test weight value, then click the “OK” button. The scale must be stable in this period. Approximately 5 seconds later, the new calibration settings are saved automatically.

Please refer to the chapter 5.6 A/D Converter Performance Test).

Electronic Calibration (eCal)

eCal allows to perform a calibration without using test weights. MCS-08AD modules are adjusted during production for increased eCal accuracy. The calibration will be done based on the scale capacity, the total load cell capacity, the load cell output and the estimated dead load. If the conditions are convenient for zero calibration, you may perform automatic zero adjustment instead of entering an estimated dead load.

	Figure 5.9 – eCal Calibration
---	--------------------------------------

After selecting eCal calibration enter the following values as:

Total Load Cell Capacity: Enter the total load cell capacity in kg as shown in the example below.

Example: If the weighing system has 4 pcs 1000 kg load cells, then enter 4000 kg.

Average Load Cell Output: Enter the load cell output in mV/V. If the weighing system has more than one load cell, calculate the mean value of the load cells output as indicated in the certificates of the individual load cells.

Example: If the load cell outputs are LC1: 2.0010, LC2: 1.9998, LC3:1.9986 and LC4:2.0002, the mean value will be LC output = $(2.0010 + 1.9998 + 1.9986 + 2.0002) \div 4 = 1.9999$ mV/V.

Estimated Dead Load: Enter the estimated dead load value of the weighing system in kg. You may perform a zero adjustment in convenient time for an exact dead load compensation. After pressing “Save eCal Data to Converter” these data will be transferred to the instrument and eCal will be finalized.

If the scale is empty and you want to make an automatic zero adjustment instead of entering an estimated dead load, then press the “eCal with Zero Adjustment” button for starting the zero calibration. The display will show the [WAIT] message during the zero adjustment for approximately 5 seconds. In this period the scale must be unloaded and stable. The eCal calibration coefficients are saved automatically.

5.6. A/D Converter Performance Test

The scale performance test should be performed before you install the bus connection. The tests are linearity, repeatability and eccentricity. You can follow the test at the virtual display and/or status tab which show the measurement data, the instrument data and the software version. For convenience keys for Taring, Zeroing and Clear are located in this tab.

5.7. Digital I/O Test

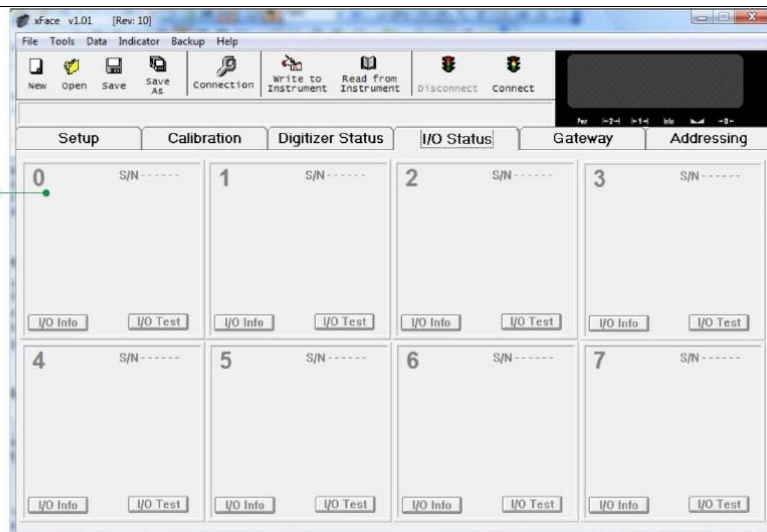


Figure 5.10 – MCS-08IO Status

35

Input / Output Test: This block allows the user to check I/O status. The I/O test button is used to test outputs as seen in this figure.

The active MCS-08IO modules are shown with their own N-Bus address block. You can follow the input and the output status and you can switch the outputs. The I/O test property is very useful for checking the output states.
Warning: Please be careful to avoid damaging your process during the output test.

5.8. N-Bus Addressing via Setup Switch

MCS-08 systems which are energized for the first time require the N-bus addressing for each A/D Converter module and each Digital I/O module. One way is the addressing by the xFace which is described above. Another way is the addressing (up to address 7) via the setup switch.

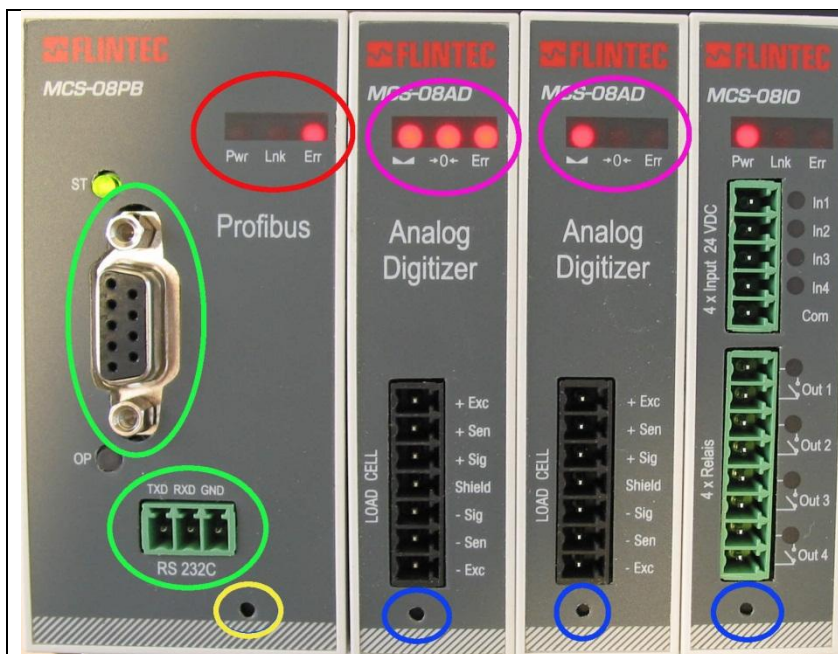


Figure 5.11 – Example

Step by step manual procedure:

1. Unplug all communication cables from the Gateway Module (RS232 and BUS plug; See GREEN).
2. First energize the modules installed on the N-Bus.
3. Press the setup switch of the gateway module for 5 seconds. (The switch is behind the hole in the front; see YELLOW). The three LEDs of the gateway module (RED) will flash 4 times and then indicate an N-Bus address number. You can change the address number by pressing the setup switch (YELLOW) slowly. While changing the address in the Gateway module, the LEDs in the other modules (PINK) will change sometimes.




























- Now change the address number on the Gateway Module by pressing the gateway switch (**YELLOW**) until it reached an address you want to use for an MCS08AD or MCS08IO module.
- To assign the selected address number to an A/D Converter or Digital I/O module press the setup switch on the selected module (**BLUE**).








Please note: The MCS08 allows up to 8 A/D and 8 I/O in one system. A/Ds and I/Os use the same address range (0 to 7). In consequence the same address can be assigned to one A/D Converter AND one Digital I/O Module.

- After assigning all modules to a defined address, press and hold the gateways switch for 5 seconds. The system will close the addressing mode and change to normal mode

Note: Do not de-energise MCS-08 while the system is in the addressing mode. If a power failure has happened, restart the system and repeat the whole addressing.

LED and Setup Switch Descriptions in the N-Bus Addressing Mode:

Gateway module			Description of LED	Description of Setup Switch
Pwr	Lnk	Err		
			Address number is [0]	Increase to address number [1]
			Address number is [1]	Increase to address number [2]
			Address number is [2]	Increase to address number [3]
			Address number is [3]	Increase to address number [4]
			Address number is [4]	Increase to address number [4]
			Address number is [5]	Increase to address number [6]
			Address number is [6]	Increase to address number [7]
			Address number is [7]	Jump to address number [0]
			Address number is higher than [7]	

MCS-08AD or MCS-08IO			Description of LED	Description of Setup Switch
	→0←	Err		
			Defined N-bus address number and gateway's selected address number are identical	Assigns the gateway's selected address number to its N-bus address number.
			Defined N-bus address number and gateway's selected address number are different	Increase to address number [2]




 Off  On  Flash

Table 5.2 – N-bus addressing via setup switch

5.9. Back up Settings and Calibration Data

The parameter settings and the calibration coefficients can be saved to a backup file after reading these data from the MCS-08 modules. This backup file can be re-written to MCS-08 modules after opening it by xFace. The backup feature gives a service advantage to MCS-08 systems. We propose to burn these files to CD / DVD and save this backup CD / DVD in the control cabinet additionally to a backup file on your PC.

Important note: The previous parameter settings and calibration coefficients in a MCS-08 module will get lost after loading a backup to this module.

5.10. Modbus Data Structure (for MCS-08MB + MCS-08EN only)

EXPLANATION

Attention: For hardware connection details, please refer to the related hardware descriptions in chapter 9 (respective chapter 12 for MCS-08EN gateway). The Modbus slave address is defined in the Modbus RTU Setup in chapter 9.4. Function code '0x03' and function code '0x10' are supported.

In the two word registers the data is stored to the registers in big-endian format. The least significant word is stored to the highest register address; and the most significant word is stored to the lowest register address. Write operations can only be done to the allowed registers. These registers are indicated as W or W/R in the tables. Do not try to write 'only read' registers indicated as R.

The Modbus data structure tables identify the N-bus address of MCS-08AD and MCS-08IO modules as [X]. Please find Modbus information on the web site of <http://www.modbus.org>

Exception codes

- 1: Function code is not supported.
- 2: Out of address range
- 3: Invalid value or wrong byte number
- 4: Operation error

Examples:

Perform Read and Write operations according to the hex system with the MCS-08MB set to address '0x01'.

Indicated value of MCS-08AD [0] at register start address 41006

Request: 01, 03, 03, ED, 00, 02, 54, 7A
Answer: 01, 03, 04, 00, 00, 27, 10, E0, 0F
Indicated: 2710 hex (10000 dec)

Status, Indicated, Gross and Tare values of MCS-08AD [0] at register 41005...41011.

Request: 01, 03, 03, EC, 00, 07, C5, B9
Answer: 01, 03, 0E, 01, 0A, 00, 00, 10, E2, 00, 00, 14, CA, 00, 00, 03, E8, BD, 55
Status: 010A hex
Indicated: 000010E2 hex (4322 dec)
Gross: 000014CA hex (5322 dec)
Tare: 000003E8 hex (1000 dec)

Indicated value of MCS-08AD [5] at register start address 41041

Request: 01, 03, 04, 10, 00, 02, C4, FE
Answer: 01, 03, 04, 00, 04, BF, 21, 0B, DA
Indicated: 0004BF21 hex (311073 dec)

Status, Indicated, Gross and Tare values of MCS-08AD [5] at register 41040...41046.

Request: 01, 03, 04, 0F, 00, 07, 35, 3B
Answer: 01, 03, 0E, 04, 22, 00, 04, BF, 38, 00, 04, BF, 38, 00, 00, 00, 00, 7D, EF
Status: 0422 hex
Indicated: 0004BF38 hex (311096 dec)
Gross: 0004BF38 hex (311096 dec)
Tare: 00000000 hex (0 dec)

Read inputs of MCS-08IO [0] at register 41071.

Request: 01, 03, 04, 2E, 00, 01, E5, 33
Answer: 01, 03, 02, 05, 0D, 7A, D1
Inputs: 0D hex (1011 binary)
Outputs: 05 hex (0101 binary)

Set all outputs of MCS-08IO [0] at register 41071.

Request: 01, 10, 04, 2E, 00, 01, 02, 00, 0F, A5, DA
Answer: 01, 10, 04, 2E, 00, 01, 60, F0
Outputs activated.

Zeroing MCS-08AD [0] at register 41062.

Request: 01, 10, 04, 25, 00, 01, 02, 00, 01, 25, 65
Answer: 01, 10, 04, 25, 00, 01, 11, 32
MCS-08AD [0] is zeroed.

Zeroing MCS-08AD [1] at register 41063.

Request: 01, 10, 04, 26, 00, 01, 02, 00, 01, 25, 56

Answer: 01, 10, 04, 26, 00, 01, E1, 32

MCS-08AD [1] is zeroed.

Taring MCS-08AD [0] at register 41062.

Request: 01, 10, 04, 25, 00, 01, 02, 00, 02, 65, 64

Answer: 01, 10, 04, 25, 00, 01, 11, 32

MCS-08AD [0] is tared.

Taring MCS-08AD [1] at register 41063.

Request: 01, 10, 04, 26, 00, 01, 02, 00, 02, 65, 57

Answer: 01, 10, 04, 26, 00, 01, E1, 32

MCS-08AD [1] is tared.

Zero Calibration of MX08 AD [0].

Request: 01, 03, 04, 66, 00, 01, 65, 25 (Read status; Ready status is mandatory)

Answer: 01, 03, 02, 00, 01, 79, 84 (MCS-08AD [0] is in ready status; zero calibration can be performed)

Request: 01, 10, 04, 63, 00, 01, 02, 00, BC, EB, B2 (Zero calibration command)

Answer: 01, 10, 00, 6D, 00, 01, 90, 14

Request: 01, 03, 04, 66, 00, 01, 65, 25 (Read status and wait for ready status)

Answer: 01, 03, 02, 00, 01, 79, 84 (If "zeroing" changed to "ready" status, zero calibration was performed successfully.)

Span Calibration of MCS-08AD [0].

Request: 01, 03, 04, 66, 00, 01, 65, 25 (Read status; Ready status is mandatory)

Answer: 01, 03, 02, 00, 01, 79, 84 (MCS-08AD [0] is in ready status; span calibration can be performed)

Request: 01, 10, 04, 63, 00, 03, 06, 00, DC, 00, 00, 0B, B8, D6, 90 (Span calibration command with 3000 (0x0BB8 hex) span value)

Answer: 01, 10, 00, 6D, 00, 03, 11, D5

Request: 01, 03, 04, 66, 00, 01, 65, 25 (Read status and wait for ready status)

Answer: 01, 03, 02, 00, 01, 79, 84 (If "span calibr." changed to ready status, span calibration was performed successfully.)

The table below is used to access MCS-08AD modules.

The starting register address 40001 is valid for N-bus address [0].

Address	R/W	Word	Command	Definition				
40001*	R	2	Weight / Force / Count Data					
40003*	R	1	Module Status of MCS-08AD	D0	0 – System Ready		1 – System Busy	
				D1	0 – Error		1 – Data ok	
				D2	0 – Weight Stable		1 – Weight unstable	
				D3	0 – Gross Mode		1 – Net mode	
				D4	0		Not used	
				D5	0 – Weight / Force		1 – Count Mode	
				D6...D11	Not used			
				D12	0 – Out of zero range		1 – Weight is in zero range	
				D13 D14 D15	Error Code	0	No Errors	
						1	ADC out of range	
						2	ADC over range	
						3	ADC under range	
4	System error							
5	In setup mode							
		6	Low/High voltage det.					
40004*	R	2	Tare weight					
40006*	R	2	Gross weight					
40008*	R	1	Status	Motion, Net mode, Data ok, (image of register 40003)				
40009*	R/W	1	Control	0	None			
				1	Zero			
				2	Tare			
				3	Clear			

Address	R/W	Word	Command	Definition								
40010*	R/W	1	Calibration	0	None							
				188	Adjust Zero Calibration							
				220	Adjust Span Calibration (First load 40011 with span test weight value)							
40011*	R/W	2	Span Calibration Value									
40013*	R	1	Calibration Status	D0 .. D7 Calibration Process Status	1	Ready for calibration						
					3	Zero calibration in process						
					4	Span calibration in process						
					9	Error (Refer to D8 ... D15)						
				D8 .. D15 Calibration Errors	1	Calibration Timeout - Restart calibration						
					2	ADC Error - Re-energize the instrument - If seen again, change the board.						
					3	Instrument can not be calibrated - Check load cell cable - Re-energize the instrument						
					34	Instrument can not be calibrating - Load cell signal is very low or too high						
					35	Calibration Error - Calibration test weight is too small - Increase calibration weight value (40011) - Check load cell connections						
					37	Scale unstable - Wait until scale becomes stable - Check grounding wiring						
40014*	R/W	1	Operation Mode Selector	0	Count Mode Unipolar							
				1	Count Mode Bipolar							
				2	Force Mode Unipolar							
				3	Force Mode Bipolar							
				4	Weight Mode Unipolar							
40015*	R/W	1	mV operation in Count Mode	0	5 mV							
				1	10 mV							
				2	15 mV							
				3	18 mV							
40016*	R/W	1	Digital filters	0	Fast							
				1								
				2								
				3								
				4								
				5	Medium							
				6								
				7	Default							
				8								
9	Slow											
N-bus address			0	1	2	3	4	5	6	7		
*Starting register address			40001	40101	40201	40301	40401	40501	40601	40701		

Address	R/W	Word	Command	Description	
41001	R	1	System Status of MCS-08AD and MCS-08DP	D0	00: No module found at address [0]
				D1	01: Module at address [0] is active
				D2	00: No module found at address [1]
				D3	01: Module at address [1] is active
				D4	00: No module found at address [2]
				D5	01: Module at address [2] is active
				D6	00: No module found at address [3]
				D7	01: Module at address [3] is active
				D8	00: No module found at address [4]
				D9	01: Module at address [4] is active

Address	R/W	Word	Command	Description				
41001	R	1	System Status of MCS-08AD and MCS-08DP	D10	00: No module found at address [5]			
				D11	01: Module at address [5] is active			
				D12	00: No module found at address [6]			
				D13	01: Module at address [6] is active			
				D14	00: No module found at address [7]			
				D15	01: Module at address [7] is active			
41002	R	1	System Status of MCS-08IO	D0	IO [0]	00 = Module at address [0] not found		
				D1		01 = Module at address [0] is active 10 = reserved 11 = reserved		
				D2	IO [1]	00 = Module at address [0] not found		
				D3		01 = Module at address [0] is active 10 = reserved 11 = reserved		
				D4	IO [2]	00 = Module at address [0] not found		
				D5		01 = Module at address [0] is active 10 = reserved 11 = reserved		
				D6	IO [3]	00 = Module at address [0] not found		
				D7		01 = Module at address [0] is active 10 = reserved 11 = reserved		
				D8	IO [4]	00 = Module at address [0] not found		
				D9		01 = Module at address [0] is active 10 = reserved 11 = reserved		
				D10	IO [5]	00 = Module at address [0] not found		
				D11		01 = Module at address [0] is active 10 = reserved 11 = reserved		
				D12	IO [6]	00 = Module at address [0] not found		
				D13		01 = Module at address [0] is active 10 = reserved 11 = reserved		
				D14	IO [7]	00 = Module at address [0] not found		
				D15		01 = Module at address [0] is active 10 = reserved 11 = reserved		
41003	R	1	Status of MCS-08MB Gateway	D0	System failure			
				D1	EEPROM failure			
				D2	External bus communication error			
				D3	A module was installed / removed			
				D4	No module found within the system			
				D5...D15	Not in use			
41004		1			Not in use			
41005	R	1	Status of MCS-08AD [0]	D0	0 – System Ready		1 – System Busy	
				D1	0 – Error		1 – Data ok	
				D2	0 – Weight Stable		1 – Weight unstable	
				D3	0 – Gross Mode		1 – Net mode	
				D4	0		Not used	
				D5	0 – Weight / Force		1 – Count Mode	
				D6...D11	Not in use			
				D12	0 – Out of zero range		1 – Weight is in zero range	
				D13 D14 D15	Error Code	0	No Errors	
						1	ADC out of range	
						2	ADC over range	
						3	ADC under range	
						4	System error	
						5	In setup mode	
						6	Low/High voltage det.	

Address	R/W	Word	Command	Description	
41006	R	2	MCS-08AD [0]:	Indicated weight	
41008	R	2	MCS-08AD [0]:	Gross weight	
41010	R	2	MCS-08AD [0]:	Tare weight	
41012	R	1	MCS-08AD [1]:	Status	
41013	R	2	MCS-08AD [1]:	Indicated weight	
41015	R	2	MCS-08AD [1]:	Gross weight	
41017	R	2	MCS-08AD [1]:	Tare weight	
41019	R	1	MCS-08AD [2]:	Status	
41020	R	2	MCS-08AD [2]:	Indicated weight	
41022	R	2	MCS-08AD [2]:	Gross weight	
41024	R	2	MCS-08AD [2]:	Tare weight	
41026	R	1	MCS-08AD [3]:	Status	
41027	R	2	MCS-08AD [3]:	Indicated weight	
41029	R	2	MCS-08AD [3]:	Gross weight	
41031	R	2	MCS-08AD [3]:	Tare weight	
41033	R	1	MCS-08AD [4]:	Status	
41034	R	2	MCS-08AD [4]:	Indicated weight	
41036	R	2	MCS-08AD [4]:	Gross weight	
41038	R	2	MCS-08AD [4]:	Tare weight	
41040	R	1	MCS-08AD [5]:	Status	
41041	R	2	MCS-08AD [5]:	Indicated weight	
41043	R	2	MCS-08AD [5]:	Gross weight	
41045	R	2	MCS-08AD [5]:	Tare weight	
41047	R	1	MCS-08AD [6]:	Status	
41048	R	2	MCS-08AD [6]:	Indicated weight	
41050	R	2	MCS-08AD [6]:	Gross weight	
41052	R	2	MCS-08AD [6]:	Tare weight	
41054	R	1	MCS-08AD [7]:	Status	
41055	R	2	MCS-08AD [7]:	Indicated weight	
41057	R	2	MCS-08AD [7]:	Gross weight	
41059	R	2	MCS-08AD [7]:	Tare weight	
41061		1	Not in use		
41062	R/W	1	MCS-08AD [0] Commands	00	None
				01	Zero
				02	Tare
				03	Clear
				04...07	Not in use
41063	R/W	1	MCS-08 AD [1] Commands		
41064	R/W	1	MCS-08 AD [2] Commands		
41065	R/W	1	MCS-08 AD [3] Commands		
41066	R/W	1	MCS-08 AD [4] Commands		
41067	R/W	1	MCS-08 AD [5] Commands		
41068	R/W	1	MCS-08 AD [6] Commands		
41069	R/W	1	MCS-08 AD [7] Commands		
41070		1	Not in use		
41071	R/W	1	MCS-08 IO [0] I/O Control	D0	Input 1
				D1	Input 2
				D2	Input 3
				D3	Input 4
				D4...D7	Reserved
				D8	Output 1
				D9	Output 2
				D10	Output 3
				D11	Output 4
				D12...D15	Reserved
41072	R/W	1	MCS-08 IO [1] I/O Control		
41073	R/W	1	MCS-08 IO [2] I/O Control		
41074	R/W	1	MCS-08 IO [3] I/O Control		
41075	R/W	1	MCS-08 IO [4] I/O Control		
41076	R/W	1	MCS-08 IO [5] I/O Control		
41077	R/W	1	MCS-08 IO [6] I/O Control		

Address	R/W	Word	Command	Description
41078	R/W	1	MCS-08 IO [7] I/O Control	
41079		1	Not in use	
41080	R	1	MCS-08 AD [0] Status	
41081	R	2	MCS-08 AD [0] Indicated Weight	
41083	R	1	MCS-08 AD [1] Status	
41084	R	2	MCS-08 AD [1] Indicated Weight	
41086	R	1	MCS-08 AD [2] Status	
41087	R	2	MCS-08 AD [2] Indicated Weight	
41089	R	1	MCS-08 AD [3] Status	
41090	R	2	MCS-08 AD [3] Indicated Weight	
41092	R	1	MCS-08 AD [4] Status	
41093	R	2	MCS-08 AD [4] Indicated Weight	
41095	R	1	MCS-08 AD [5] Status	
41096	R	2	MCS-08 AD [5] Indicated Weight	
41098	R	1	MCS-08 AD [6] Status	
41099	R	2	MCS-08 AD [6] Indicated Weight	
41101	R	1	MCS-08 AD [7] Status	
41102	R	2	MCS-08 AD [7] Indicated Weight	
41104		1	Not in use	
41105	R	1	All MCS-08 AD Status: Zero + Motion	D0 0 Out of Zero 1 – In Zero Range MCS-08 AD [0]
				D1 0 Weight stable 1 – Unstable MCS-08 AD [0]
				D2 0 Out of Zero 1 – In Zero Range MCS-08 AD [1]
				D3 0 Weight stable 1 – Unstable MCS-08 AD [1]
				D4 0 Out of Zero 1 – In Zero Range MCS-08 AD [2]
				D5 0 Weight stable 1 – Unstable MCS-08 AD [2]
				D6 0 Out of Zero 1 – In Zero Range MCS-08 AD [3]
				D7 0 Weight stable 1 – Unstable MCS-08 AD [3]
				D8 0 Out of Zero 1 – In Zero Range MCS-08 AD [4]
				D9 0 Weight stable 1 – Unstable MCS-08 AD [4]
				D10 0 Out of Zero 1 – In Zero Range MCS-08 AD [5]
				D11 0 Weight stable 1 – Unstable MCS-08 AD [5]
				D12 0 Out of Zero 1 – In Zero Range MCS-08 AD [6]
				D13 0 Weight stable 1 – Unstable MCS-08 AD [6]
				D14 0 Out of Zero 1 – In Zero Range MCS-08 AD [7]
				D15 0 Weight stable 1 – Unstable MCS-08 AD [7]
41106	R	1	All MCS-08 AD Status: OK + Active	D0 0 Error 1 – Data OK MCS-08 AD [0]
				D1 0 Not in system 1 – Active MCS-08 AD [0]
				D2 0 Error 1 – Data OK MCS-08 AD [1]
				D3 0 Not in system 1 – Active MCS-08 AD [1]
				D4 0 Error 1 – Data OK MCS-08 AD [2]
				D5 0 Not in system 1 – Active MCS-08 AD [2]
				D6 0 Error 1 – Data OK MCS-08 AD [3]
				D7 0 Not in system 1 – Active MCS-08 AD [3]
				D8 0 Error 1 – Data OK MCS-08 AD [4]
				D9 0 Not in system 1 – Active MCS-08 AD [4]
				D10 0 Error 1 – Data OK MCS-08 AD [5]
				D11 0 Not in system 1 – Active MCS-08 AD [5]
				D12 0 Error 1 – Data OK MCS-08 AD [6]
				D13 0 Not in system 1 – Active MCS-08 AD [6]
				D14 0 Error 1 – Data OK MCS-08 AD [7]
				D15 0 Not in system 1 – Active MCS-08 AD [7]
41107	R	2	MCS-08 AD [0] Indicated Weight	
41109	R	2	MCS-08 AD [1] Indicated Weight	
41111	R	2	MCS-08 AD [2] Indicated Weight	
41113	R	2	MCS-08 AD [3] Indicated Weight	
41115	R	2	MCS-08 AD [4] Indicated Weight	
41117	R	2	MCS-08 AD [5] Indicated Weight	
41119	R	2	MCS-08 AD [6] Indicated Weight	
41121	R	2	MCS-08 AD [7] Indicated Weight	

5.11. Profibus and ProfiNet Data Structure (for MCS-08Px only)

MCS-08Px Output to PLC Input

MCS-08Px	1 st Dword (R)	D31	D30	D29	D28	D27	D27	D25	D24	D23	D22	D21	D20	D19	D18	D17	D16
		Active MCS-08IO modules								Active MCS-08AD modules							
		D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
		Error Table				Not in use								Read Data Selected Resp.		CMD flag	

Bit no.	1 st Dword Description			
D31	0: No module found		1: MCS-08IO at address [7] is active	Active MCS-08IO modules
D30	0: No module found		1: MCS-08IO at address [6] is active	
D29	0: No module found		1: MCS-08IO at address [5] is active	
D28	0: No module found		1: MCS-08IO at address [4] is active	
D27	0: No module found		1: MCS-08IO at address [3] is active	
D26	0: No module found		1: MCS-08IO at address [2] is active	
D25	0: No module found		1: MCS-08IO at address [1] is active	
D24	0: No module found		1: MCS-08IO at address [0] is active	
D23	0: No module found		1: MCS-08AD at address [7] is active	Active MCS-08AD modules
D22	0: No module found		1: MCS-08AD at address [6] is active	
D21	0: No module found		1: MCS-08AD at address [5] is active	
D20	0: No module found		1: MCS-08AD at address [4] is active	
D19	0: No module found		1: MCS-08AD at address [3] is active	
D18	0: No module found		1: MCS-08AD at address [2] is active	
D17	0: No module found		1: MCS-08AD at address [1] is active	
D16	0: No module found		1: MCS-08AD at address [0] is active	
D15 D14 D13 D12	Error Codes	0000	No error found	Error Codes of MCS-08Px
		0001	System failure. Re-energize module. If happens again, replace module.	
		0010	EEPROM failure. Re-energize module. If happens again, replace module.	
		0011	Gateway module error. Re-energize module. Check if gateway module is installed. If happens again, replace module.	
		0100	No module found on N-bus. Install MCS-08AD or MCS-08IO modules. Check N-bus connectors if installed.	
		0101	A module was installed/removed. Re-address the modules on the N-bus.	
D11...D4	Not in use			
D3 D2 D1	Read Command Response	010	All active MCS-08AD modules refer to D16...D31	Read selected response
		001	Active MCS-08IO modules refer to D16...D31	
		000	All active modules refer to D16...D31 (default)	
D0	Toggles	The command is applied successfully		CMD flag

MCS-08 AD [0]*	2 nd Dword (R)	D31	D30	D29	D28	D27	D27	D25	D24	D23	D22	D21	D20	D19	D18	D17	D16
		D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
	Indicated weight value will be shown in this Dword																
	3 rd Dword (R)	D31	D30	D29	D28	D27	D27	D25	D24	D23	D22	D21	D20	D19	D18	D17	D16
		Not In Use															
		D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
		Error Table Of MCS-08AD Modul						Count mode	Zero range	Net	Motion	Response of Read Selected Data.				CMD flag	

*Register address for MCS-08AD [1]: 4th...5th Dword,
MCS-08AD [2]: 6th...7th Dword,
MCS-08AD [3]: 8th...9th Dword,
MCS-08AD [4]: 10th...11th Dword,
MCS-08AD [5]: 12th...13th Dword,
MCS-08AD [6]: 14th...15th Dword,
MCS-08AD [7]: 16th...17th Dword

Bit no.	3 rd , 5 th , 7 th , 9 th , 11 th , 13 th , 15 th , 17 th Dword Description			
D31...D16	Not in use			
D15...D12	Error Codes	0111	Module not found	Error Codes of MCS-08AD
		0110	Low/High voltage detetction error	
		0101	In setup mode	
		0100	System error	
		0011	ADC underrange	
		0010	ADC overload	
		0001	ADC out	
		0000	No error found	
D11...D10	Not in use			
D9	Operation Mode	0	Weight / Force mode	Status of MCS-08AD
		1	Count mode	
D8	Zero Range	0	Out of zero range	
		1	In zero range	
D7	Indication	0	Gross	
		1	Net	
D6	Motion Detection	0	Stable	
		1	Unstable	
D5 D4 D3 D2 D1		00000	Indicated weight	Response of 2 nd Dword description
		00001	Gross weight	
		00010	Tare weight	
		00011	Indicated weight (floating point type)	
		00100	Gross weight (floating point type)	
		00101	Tare weight (floating point type)	
		00110	Increased resolution for indicated weight	
D0	Toggles	The command is applied successfully		CMD flag

Bit no.	2 nd , 4 th , 6 th , 8 th , 10 th , 12 th , 14 th , 16 th Dword Description when Read Command is 'Calibration Status'. Refer to PLC output to MCS-08Px input for 3 rd Dword			
D31...D16	Not in use			
D15 D14 D13 D12 D11 D10 D9 D8	Error Codes	0000 0001	Calibration timeout - Restart calibration	Calibration Status of MCS-08AD
		0000 0010	ADC error - Re-energize the module	
		0000 0011	Module can not be calibrated - Load cell signal is very low or too high	
		0010 0010	Module cannot be calibrated. Load cell signal is very low or too high.	
		0010 0011	Calibration Error - Calibration test weight is too small - Increase calibration weight value (Write test weight value from PLC Output to MCS-08Px Input 2 nd Dword then restart the calibration) - Check load cell connections	
		0010 0101	Scale unstable - Wait until scale becomes stable - Check ground wiring	
		D11...D10	Not in use	

D7	Error Codes	0000 1001	Calibration Errors
D6		0000 0010	Span calibration in progress
D5		0000 0011	Zero calibration in progress
D4		0010 0010	System ready for calibration
D3			
D2			
D1			
D0			

MCS-08IO [x]	Byte	D7	D6	D5	D4	D3	D2	D1	D0
MCS-08IO [0]	+1 st Byte					Input 4	Input 3	Input 2	Input 1
MCS-08IO [1]	+2 nd Byte					Input 4	Input 3	Input 2	Input 1
MCS-08IO [2]	+3 rd Byte					Input 4	Input 3	Input 2	Input 1
MCS-08IO [3]	+4 th Byte					Input 4	Input 3	Input 2	Input 1
MCS-08IO [4]	+5 th Byte					Input 4	Input 3	Input 2	Input 1
MCS-08IO [5]	+6 th Byte					Input 4	Input 3	Input 2	Input 1
MCS-08IO [6]	+7 th Byte					Input 4	Input 3	Input 2	Input 1
MCS-08IO [7]	+8 th Byte					Input 4	Input 3	Input 2	Input 1

PLC Output to MCS-08Px Input

MCS-08Px	1 st Dword (W)	D31	D30	D29	D28	D27	D26	D25	D24	D23	D22	D21	D20	D19	D18	D17	D16
		Not in use															
		D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
		Not in use							I/O Write	Common Command List			Data Selection			CMD flag	

Bit no.	1 st Dword Description	
D31...D9	Not in use	
D8	0	I/Os are changed by PLC output to MCS-08Px input I/O bytes. This flag does not need the New CMD command
	1	I/Os are changed by Common Command List below: 1000- SET or 1001- RESET
D7 D6 D5 D4	0000	No error found
	0001	Zeroing command sent to all MCS-08AD modules
	0010	Tare command sent to all MCS-08AD modules
	0011	Clear command sent to all MCS-08AD modules
	1000	SET all outputs of all MCS-08IO modules (if I/O Write Control = 1)
	1001	RESET all outputs of all MCS-08IO modules (if I/O Write Control = 1)
D3 D2 D1	000	All active MCS-08xx modules refer to D16...D31 of MCS-08Px output to PLC input 1 st Dword (default)
	001	All active MCS-08IO modules refer to D16...D31 of MCS-08Px output to PLC input 1 st Dword
	010	All active MCS-08AD modules refer to D16...D31 of MCS-08Px output to PLC input 1 st Dword
D0	Toggles	Apply commands which are listed in this table

MCS-08 AD [0]*	2 nd Dword (W)	D31	D30	D29	D28	D27	D27	D25	D24	D23	D22	D21	D20	D19	D18	D17	D16
		D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
	Next Dword defines the usage of this Dword																
	3 rd Dword (W)	D31	D30	D29	D28	D27	D27	D25	D24	D23	D22	D21	D20	D19	D18	D17	D16
		Not In Use															
		D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
		Not in use					Command List					Description of 2 nd Dword (R)					CMD flag

*Register address for MCS-08AD [1]: 4th...5th Dword,
MCS-08AD [2]: 6th...7th Dword,
MCS-08AD [3]: 8th...9th Dword,
MCS-08AD [4]: 10th...11th Dword,
MCS-08AD [5]: 12th...13th Dword,
MCS-08AD [6]: 14th...15th Dword,
MCS-08AD [7]: 16th...17th Dword definitions are same as 2nd – 3rd Dwords

Bit no.	3 rd , 5 th , 7 th , 9 th , 11 th , 13 th , 15 th , 17 th Dword Description		
D31...D11	Not in use		
D10 D9 D8 D7 D6	00000	No command selected	Command list
	00001	Zero	
	00010	Tare	
	00011	Clear	
	00101	Start zero calibration	
	00110	Start span calibration. First load 2 nd Dword with test weight, then apply this command with New CMD.	
	01000	Operation mode selection. First load 2 nd Dword with selected value, then apply this command with New CMD. 0 = Count mode unipolar, 1 = Count mode bipolar, 2 Force mode unipolar, 3 = Force mode bipolar, 4 = Weight mode unipolar	
	01001	mV operation in Count Mode. First load 2 nd Dword with selected value, then apply this command with New CMD. 0 = 5mV, 1 = 10mV, 2 = 15 mV, 3 = 18mV	
D5 D4 D3 D2 D1	01010	Digital filter. First load 2 nd Dword with selected value, then apply this command with New CMD. Filter values: 0 = Fast,....., 9 = Slow	Description of 2 nd Dword (R)
	00000	Indicated weight	
	00001	Gross weight	
	00010	Tare weight	
	00011	Indicated weight (floating point type)	
	00100	Gross weight (floating point type)	
	00101	Tare weight (floating point type)	
	00110	Increased resolution for indicated weight	
D0	10000	Calibration status	
	Toggle	Apply command (of the commands listed in this table)	New CMD

MCS-08IO [x]	Byte (W)	D7	D6	D5	D4	D3	D2	D1	D0
MCS-08IO [0]	+1 st Byte (W)					Output 4	Output 3	Output 2	Output 1
MCS-08IO [1]	+2 nd Byte (W)					Output 4	Output 3	Output 2	Output 1
MCS-08IO [2]	+3 rd Byte (W)					Output 4	Output 3	Output 2	Output 1
MCS-08IO [3]	+4 th Byte (W)					Output 4	Output 3	Output 2	Output 1
MCS-08IO [4]	+5 th Byte (W)					Output 4	Output 3	Output 2	Output 1
MCS-08IO [5]	+6 th Byte (W)					Output 4	Output 3	Output 2	Output 1
MCS-08IO [6]	+7 th Byte (W)					Output 4	Output 3	Output 2	Output 1
MCS-08IO [7]	+8 th Byte (W)					Output 4	Output 3	Output 2	Output 1

6. MCS-08AD – A/D CONVERTER MODULE

MCS-08AD modules are state-of-the-art strain gauge load cell signal digitizers. These modules are used for any type of process weighing and force measurement including tank and silo weighing, dynamic weighing, check weighing, filling, tension /compression force measurement etc.

6.1. Front View

There are 3 status LEDs on the front panel which indicate the operational module status (Refer to table 6.1). The setup switch on front panel of the module is used for N-bus addressing without PC (Refer to chapter 5.6) and for diagnostics (Refer to chapter 15).

When the error LED is ON, the other two LED indicate the error type (Refer to chapter 14 for details). Load cell connection and power supply terminals are located at the front of the DIN rail mount module (See figure 6.1).

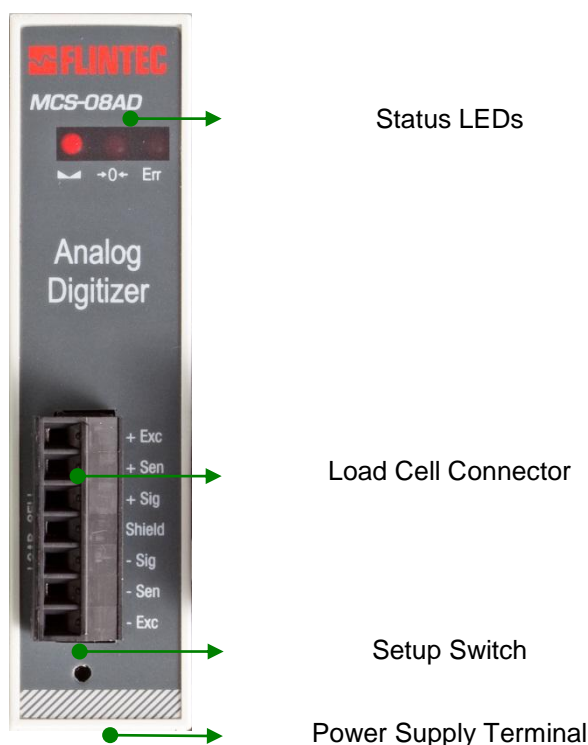


Figure 6.1 – Front view

The meanings of these LEDs in operation are described below.

LED		Operational Mode	
Symbol	Name	Weight / Force	Count
	Stable	<ul style="list-style-type: none"> ● Stable ○ Unstable 	<ul style="list-style-type: none"> ⏸ Off for 0.3 seconds in 2 seconds period (No stable indication)
	Centre of Zero	<ul style="list-style-type: none"> ● in the centre of zero range ($-0.25 e < w < 0.25 e$) ○ Out of centre of zero range 	<ul style="list-style-type: none"> ○ Always off (No centre of zero indication)
Err	Error (*)	<ul style="list-style-type: none"> ● ADC conversion error ⚡ Digital processing error ○ No error 	<ul style="list-style-type: none"> ● ADC conversion error ⚡ Digital processing error ○ No error

○ Off ● On ⚡ Flashing ⏸ Off for 0.3 seconds

(*) : Refer to the error table in chapter 14

Table 6.1 – Status LEDs

6.2. Electrical Connections

Load Cell Connection

See chapter 4.2.2

Power Supply Connection

See chapter 4.2.1

6.3. Setup and Calibration

MCS-08AD modules are set up and calibrated by xFace. The A/D Converter settings are very important for a good weighing performance. Please refer to chapter 5.3.

7. MCS-08DP – DISPLAY MODULE

The MCS-08DP module is a display unit for the MCS-08 system. The weight/force or count data and stable, zero, net information of one MCS-08AD module can be displayed. All installed MCS-08AD modules on the N-Bus are indicated with their N-Bus address information. Two keys on the front panel are used for selecting the A/D Converter module to display the weight or count data.

7.1. Front View

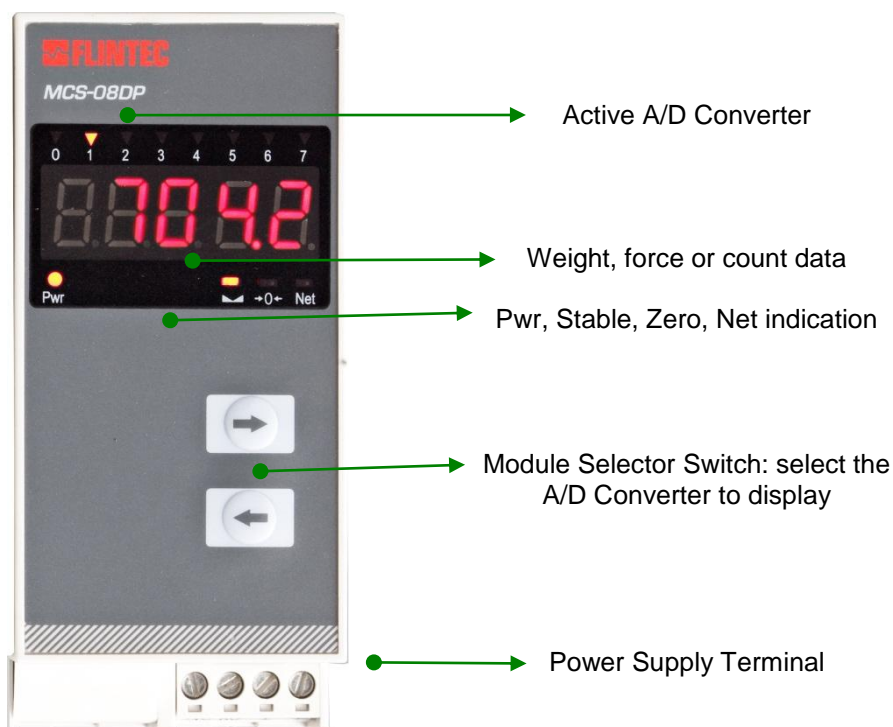


Figure 7.1 – Front view

The meanings of these LEDs in operation are described below.

LED		
Symbol	Name	Description
	Active MCS-08AD module	<ul style="list-style-type: none"> ● Module is active ⚙ Currently displayed module ○ No module installed
	Stable	<ul style="list-style-type: none"> ● Stable ○ Unstable
	Centre of Zero	<ul style="list-style-type: none"> ● In the centre of zero range ($-0.25 e < w < 0.25 e$) ○ Out of the centre of zero range
Net	Net	<ul style="list-style-type: none"> ● Net indication ○ Gros indication
Pwr	Power	<ul style="list-style-type: none"> ● Power indication ○ Displayed data is overflown to 6th or 7th digit

Table 7.1 – Status LEDs

7.2. Electrical Connections

Power Supply Connection

See chapter 4.2.1

8. MCS-08IO – DIGITAL I/O MODULE

The MCS-08IO module has 4 opto-isolated digital inputs and 4 potential-free relay outputs. All I/O control is done over the external bus system or the xFace software. Please refer to the data structure of the related gateway module for the available input and output commands. For example, with a Profibus gateway all input and output conditions are by Profibus commands.

8.1. Front View

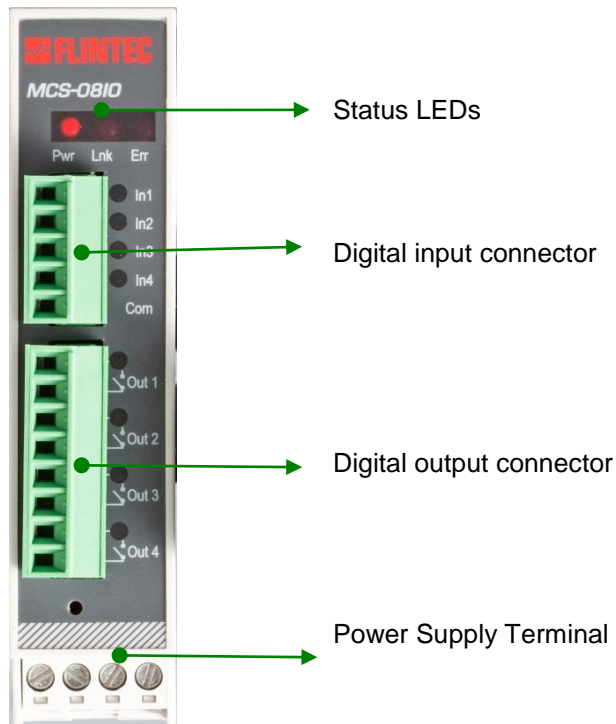


Figure 8.1 – Front view

The meanings of these LEDs in operation are described below.

LED		
Symbol	Name	Description
Pwr	Power	<div>●</div> Module is energized <div>○</div> Module is de-energized. Check power cable
Lnk	Link	<div>◐</div> Input / output state changed
Err	Error	<div>●</div> Error. Refer to error table in chapter 14 <div>○</div> No error

○ Off ● On ◐ Off for 0.3 seconds

8.2. Electrical Connections

Digital I/O Connection

See chapter 4.2.3

Power Supply Connection

See chapter 4.2.1

9. MCS-08MB – MODBUS RTU GATEWAY

The MCS-08MB gateway module integrates up to 8 pcs. MCS-08AD A/D Converter modules and up to 8 pcs. MCS-08IO Digital I/O modules to an external Modbus RTU bus. The MCS-08MB gateway module communicates with other MCS-08 modules via the internal N-bus and responses to the PLC via Modbus RTU.

9.1. Front View

There are 3 status LEDs on the front panel which indicate the operational module status (Refer to table 9.1). The setup switch on front panel of the module is used for N-bus addressing without PC (Refer to chapter 5.6) and for diagnostics (Refer to chapter 15).

When the error LED is ON, the other two LED indicate the error type (Refer to chapter 14 for details). Power supply and serial interface terminals are located at the front of the DIN rail mount module (See figure 9.1).

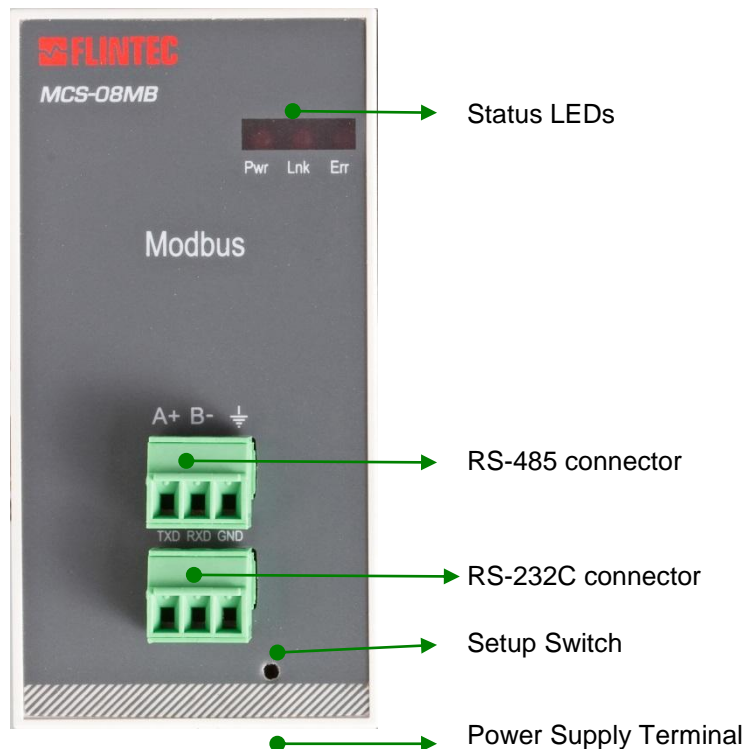


Figure 9.1 – Front view

The meanings of these LEDs in operation are described below.

Status LEDs		
Symbol	Name	Description
Pwr	Power	<div>●</div> Module is energized <div>○</div> Module is de-energized. Check power cable
Lnk	Link	<div>◐</div> Communication takes place <div>○</div> No communication
Err	Error	<div>●</div> Error. Refer to error table in chapter 14 <div>○</div> No error

○ Off ● On ◐ Off for 0.3 seconds

Table 9.1 – Status LEDs

9.2. Electrical Connections

RS232C and RS-485 connections are shown in figure 9.2.

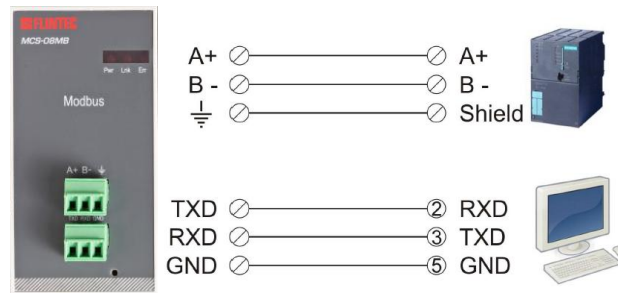


Figure 9.2 – MCS-08MB serial interface connection

RS-232C Serial Interface

Use	Setup via xFace
Baud rate	9600 (Default)
Length and parity	8 bit, no parity
Start / Stop bits	1 start bit and 1stop bit

RS-485 Serial Interface

Use	Interfacing with PC or PLC
Data format	Modbus RTU
Baud rate	1200 / 2400 / 4800 / 9600 (Default) / 19200 / 38400 / 57600 bps
Length and parity	8, no parity, 1 (Default) / 7, Odd, 1 / 7, Even, 1
Start / Stop bits	1 start bit and 1stop bit

Warning: Connect the shield to the reference ground.

Warning: Disconnect xFace PC software for Modbus-RTU interfacing

Power Supply Connection

See chapter 4.2.1

9.3. N-Bus Addressing

MCS-08 modules communicate to each other over the internal N-bus. The MCS-08xx gateway module is the master of the internal N-bus. All other MCS-08 modules are slaves and have to be addressed to the gateway module. The N-bus addressing can be done by using the xFace PC software (refer to chapter 5.3) or via setup switch (refer to chapter 5.8).

9.4. Modbus RTU Setup

If the gateway is a MCS-08MB module and set up for Modbus, the MCS-08 system can be used as a Modbus RTU slave in a RS-485 communication network. Function codes '0x03' and '0x10' are supported.

For the Modbus RTU setup please refer to this chapter, for the Modbus data structure please refer to chapter 5.11.

The Modbus RTU setup is done by the xFace software. Connect the gateway module with your PC via the RS-232C service port on the module as shown in figure 9.2. After connecting the xFace software with the gateway module select the Gateway tab. The Gateway tab is shown in figure 9.3. It displays all gateway information and Modbus-RTU settings.

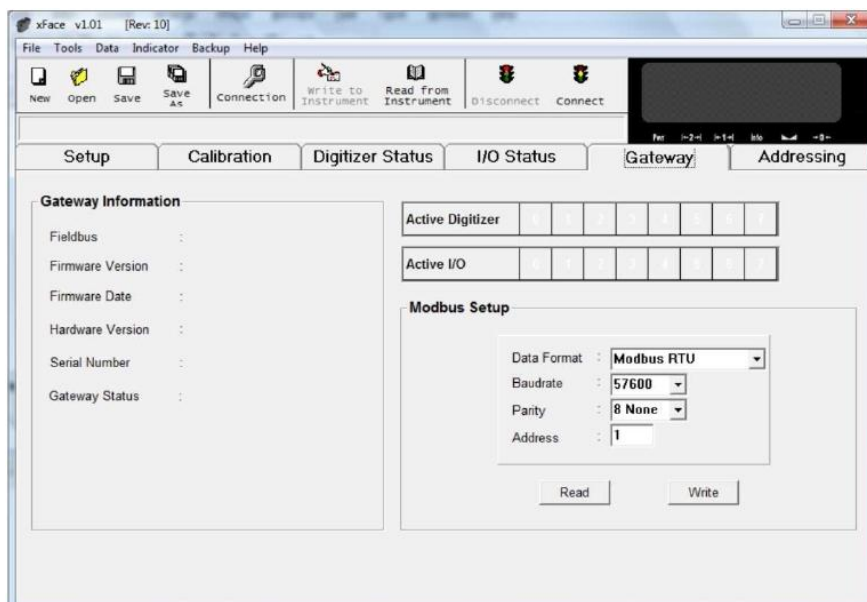


Figure 9.3 – MCS-08MB gateway setup

You will see the Modbus setup in this tab.

Data Format

Modbus RTU

Baud Rate

One of the following baudrate will be selected for the RS-485 communication port.

1200	2400	4800	9600 (default setting)
19200	38400	57600	

Data Length and Parity

The data length and parity can be selected as 8 None 1 (default), 7 Odd 1 or 7 Even 1.

RS485 Address

Data Format Modbus RTU: The Modbus slave address range is 01 (default) to 31.

If you enter 0, the instrument will operate without address data.

Displayed Gateway Information

External Bus: Modbus RTU

Firmware Version: Revision number of the firmware

Firmware Date: Release date of the firmware

Hardware Version: Revision number of the main printed circuit board

Serial Number: The module's serial number

Gateway Status: Indicates the system OK status

Modbus RTU Data Structure

Please refer to chapter 5.11

10. MCS-08PB – PROFIBUS GATEWAY

The MCS-08PB gateway module integrates up to 8 pcs. MCS-08AD A/D Converter modules and up to 8 pcs. MCS-08IO Digital I/O modules to an external Profibus network. The MCS-08PB gateway module communicates with other MCS-08 modules via the internal N-bus and responses to the PLC via Profibus DP. The GSD file is available on a CD which is supplied together with the instrument.

10.1. Front View

There are 5 status LEDs on the front panel which indicate the operational module status (Refer to table 10.1) and the Profibus status. The setup switch on front panel of the instrument is used for N-bus addressing without PC (Refer to chapter 5.6) and for diagnostics (Refer to chapter 15). When the error LED is ON, the other two LED indicate the error type (Refer to chapter 14 for details). Profibus connection, power supply and serial interface terminals are located at the front of the DIN rail mount module (See figure 10.1).

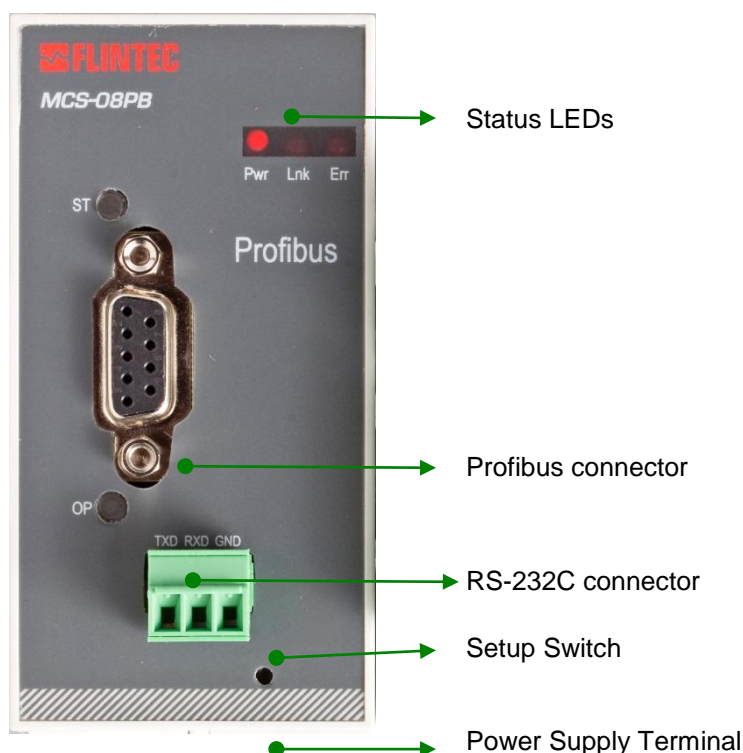


Figure 10.1 – Front view

The meanings of these LEDs in operation are described below.

Status LEDs		
Symbol	Name	Description
Pwr	Power	<div>●</div> Module is energized <div>○</div> Module is de-energized. Check power cable
Lnk	Link	<div>◐</div> Communication takes place <div>○</div> No communication
Err	Error	<div>●</div> Error. Refer to error table in chapter 14 <div>○</div> No error

○ Off ● On ◐ Off for 0.3 seconds

Table 10.1 – Status LEDs

ST Status LED

State	Indication	Comment
Off	No power or not initialized	No power or profibus module is in initializing
Green	Initialized	
Flashing Green	Initialized, diagnostic event(s) present	Diagnostic is active
Red	Exception error	There is an exception error

OP Operation Mode LED

State	Indication	Comment
Off	Not on-line / No power	Check power and cable
Green	On-line, data exchange	-
Flashing Green	On-line, clear	-
Flashing Red (2x)	PROFIBUS configuration error	Check GSD file configuration.

10.2. Electrical Connections

Profibus and RS-232C connections are shown in figure 10.2.

PROFIBUS Connector (DB9F)

Pin	Signal	Description
1	-	-
2	-	-
3	B Line	Positive RxD / TxD, RS-485 level
4	RTS	Request to send
5	GND Bus	Ground (isolated)
6	+5V Bus output	+5V termination power (isolated)
7	-	-
8	A Line	Negative RxD / TxD, RS-485 level
9	-	-
Housing	Cable shield	Ground

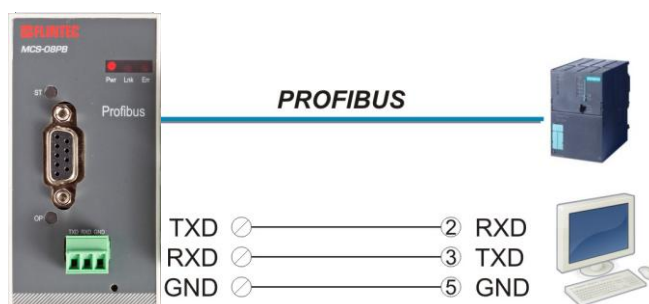


Figure 10.2 – MCS-08PB interface connections

RS-232C Serial Interface

Use	Setup via xFace
Baud rate	9600 bps
Length and parity	8 bit no parity
Start / Stop bits	1 start bit and 1 stop bit

Profibus-DP Interface

Use	Interfacing with PC or PLC
Data format	Profibus
Baud rate	Automatically detected and supported baud rates are 9.6 kbps, 19.2 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5Mbps, 3 Mbps, 6 Mbps and 12 Mbps. No 'baud rate' instance exists.

Warning: Connect the shield to the reference ground or shield pin of the power connector.

Warning: Disconnect xFace PC software for Profibus interfacing.

Power Supply Connection:

See chapter 4.2.1

10.3. N-Bus Addressing

MCS-08 modules communicate to each other over the internal N-bus. The MCS-08xx gateway module is the master of the internal N-bus. All other MCS-08 modules are slaves and have to be addressed to the gateway module. The N-bus addressing can be done by using the xFace PC software (refer to chapter 5.3) or via setup switch (refer to chapter 5.8).

10.4. Profibus Setup

The Profibus setup is done by the xFace software. Connect the gateway module with your PC via the RS-232C service port on the module as shown in figure 10.2. After connecting the xFace software with the gateway module select the Gateway tab. The Gateway tab is shown in figure 10.3. It displays all gateway information and Profibus settings.

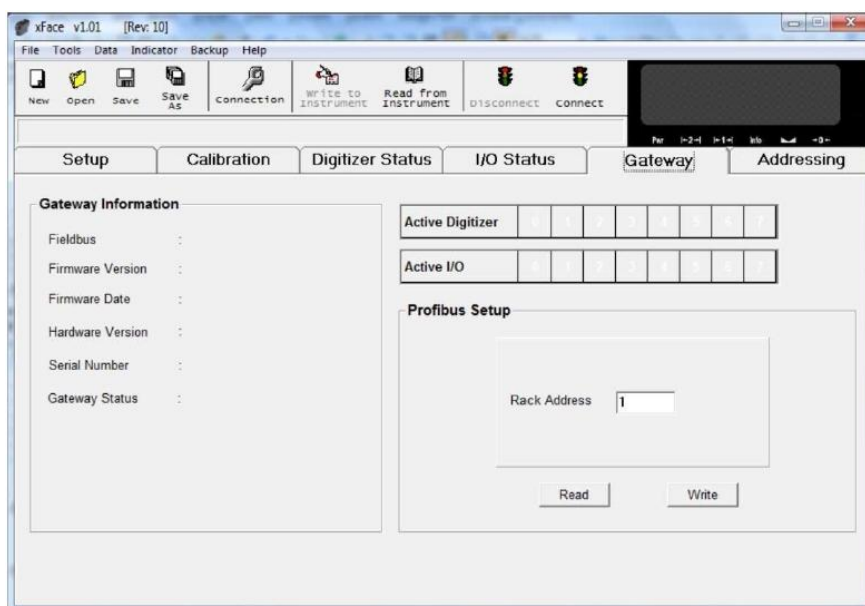


Figure 10.3 – MCS-08PB gateway setup

You will see the Profibus setup in this tab.

Profibus Rack Address

The Profibus rack address range is 01 (default) to 126.

Displayed Gateway Information

External Bus: Profibus DP

Firmware Version: Revision number of the firmware

Firmware Date: Release date of the firmware

Hardware Version: Revision number of the main printed circuit board

Serial Number: The module's serial number

Gateway Status: Indicates the system OK status

Profibus DP Data Structure

Please refer to chapter 5.12

11. MCS-08PN – PROFINET GATEWAY

The MCS-08PN gateway module integrates up to 8 pcs. MCS-08AD A/D Converter modules and up to 8 pcs. MCS-08IO Digital I/O modules to an external ProfiNet network. The MCS-08PN gateway module communicates with other MCS-08 modules via the internal N-bus and responses to the PLC via ProfiNet. The GSD file is available on a CD which is supplied together with the instrument.

11.1. Front View

There are 6 status LEDs on the front panel which indicate the operational module status (Refer to table 11.1) and the ProfiNet status. The setup switch on front panel of the module is used for N-bus addressing without PC (Refer to chapter 5.6) and for diagnostics (Refer to chapter 15).

When the error LED is ON, the other two LED indicate the error type (Refer to chapter 14 for details).

ProfiNet connection, power supply and serial interface terminals are located at the front of the DIN rail mount module (See figure 11.1).

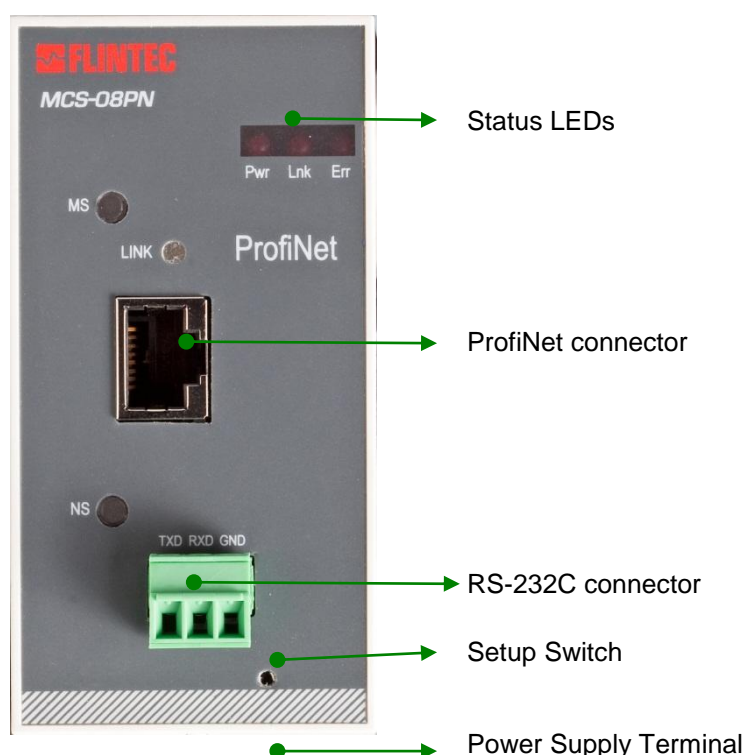


Figure 11.1 – Front view

The meanings of these LEDs in operation are described below.

Status LEDs		
Symbol	Name	Description
Pwr	Power	<div>●</div> Module is energized <div>○</div> Module is de-energized. Check power cable
Lnk	Link	<div>◐</div> Communication takes place <div>○</div> No communication
Err	Error	<div>●</div> Error. Refer to error table in chapter 14 <div>○</div> No error

○ Off ● On ◐ Off for 0.3 seconds

Table 11.1 – Status LEDs

MS Module Status LED

LED State	Description	Comment
Off	No power or not initialized	No power or ProfiNet module is in initialization state
Green	Initialized	
Green, 1 flash	Initialized, diagnostic event(s) present	Diagnostic is active
Green, 2 flashes	Blink	Used by engineering tools to identify the node on the network
Red	Exception error	There is an exception error
Red, 1 flash	Configuration error	Check EDS configuration
Red, 2 flashes	IP address error	IP address not set
Red, 3 flashes	Station name error	Station name not set
Red, 4 flashes	Internal module error	Re-energize the instrument. If seen again, change the module.

LINK/Activity LED

LED State	Description	Comment
Off	No Link	No link, no communication present
Green	Link	Ethernet link established, no communication present
Green, flickering	Activity	Ethernet link established, communication present

NS Network Status LED

LED State	Description	Comment
Off	Not online /No power	Check power and cable
Green	On-line (RUN)	-
Green, flashing	On-line (STOP)	-

11.2. Electrical Connections

ProfiNet and RS-232C connections are shown in figure 11.2.



Figure 11.2 – MCS-08PN interface connections

RS-232C Serial Interface

Use	Setup via xFace
Baud rate	9600 bps
Length and parity	8 bit no parity
Start / Stop bits	1 start bit and 1stop bit

ProfiNet Interface

Use	ProfiNet interface with PC or PLC
Data format	ProfiNet
Ethernet	The Ethernet interface operates at 100Mbit, full duplex, as required by ProfiNet.

Warning: Connect the shield to the reference ground or the shield pin of the power connector.

Warning: Disconnect xFace PC software for ProfiNet interfacing.

Power Supply Connection

See chapter 4.2.1

11.3. N-Bus Addressing

MCS-08 modules communicate to each other over the internal N-bus. The MCS-08xx gateway module is the master of the internal N-bus. All other MCS-08 modules are slaves and have to be addressed to the gateway module. The N-bus addressing can be done by using the xFace PC software (refer to chapter 5.3) or via setup switch (refer to chapter 5.8).

11.4. ProfiNet Setup

The ProfiNet setup is done by the xFace software. Connect the gateway module with your PC via the RS-232C service port on the module as shown in figure 11.2. After connecting the xFace software with the gateway module select the Gateway tab. The Gateway tab is shown in figure 11.3. It displays all gateway information and ProfiNet settings.

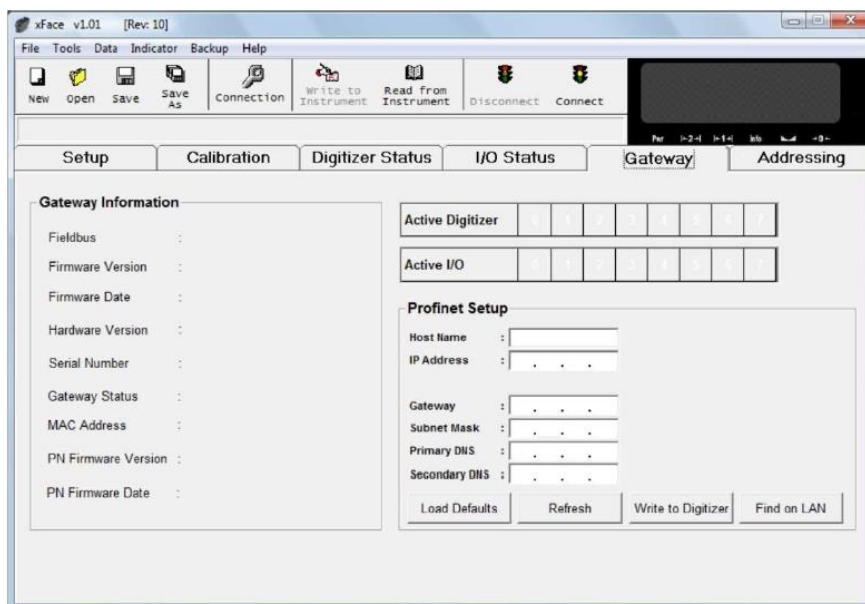


Figure 10.3 – MCS-08PN gateway setup

You will see the ProfiNet setup in this tab.

ProfiNet Setup

There are 7 setup parameters for ProfiNet network.

DHCP	Dynamic Host Configuration Protocol automates network parameters if it is enabled. Default is 'Disable'.
Host Name	Enter a unique host name to the instrument. Default is ''
IP Address	If DHCP is disabled, define IP address manually. Default is '192.168.16.250'
Default Gateway	If DHCP is disabled, define default gateway manually. Default is '192.168.16.254'.
Subnet Mask	If DHCP is disabled, define subnet mask manually. Default is '255.255.255.0'.
Primary DNS	If DHCP is disabled, define primary DNS manually. Default is '208.67.222.222'..
Secondary DNS	If DHCP is disabled, define secondary DNS manually. Default is '208.67.220.220'.
Default password	"123456"

Displayed Gateway Information

External Bus: Profibus DP

Firmware Version / PN Firmware Version: Revision number of the firmware

Firmware Date / PN Firmware Date: Release date of the firmware

Hardware Version: Revision number of the main printed circuit board

Serial Number: The module's serial number

Gateway Status: Indicates the system OK status

MAC Address: The module's MAC address.

ProfiNet Data Structure

Please refer to chapter 5.12

12. MCS-08EN – ETHERNET GATEWAY

The MCS-08EN gateway module integrates up to 8 pcs. MCS-08AD A/D Converter modules and up to 8 pcs. MCS-08IO Digital I/O modules to an external Ethernet network. The MCS-08EN gateway module communicates with other MCS-08 modules via the internal N-bus and responses to the PLC via Ethernet.

12.1. Front View

There are 3 status LEDs on the front panel which indicate the operational module status (Refer to table 12.1). The setup switch on front panel of the module is used for N-bus addressing without PC (Refer to chapter 5.6) and for diagnostics (Refer to chapter 15).

When the error LED is ON, the other two LED indicate the error type (Refer to chapter 14 for details).

Ethernet connection, power supply and serial interface terminals are located at the front of the DIN rail mount module (See figure 12.1).

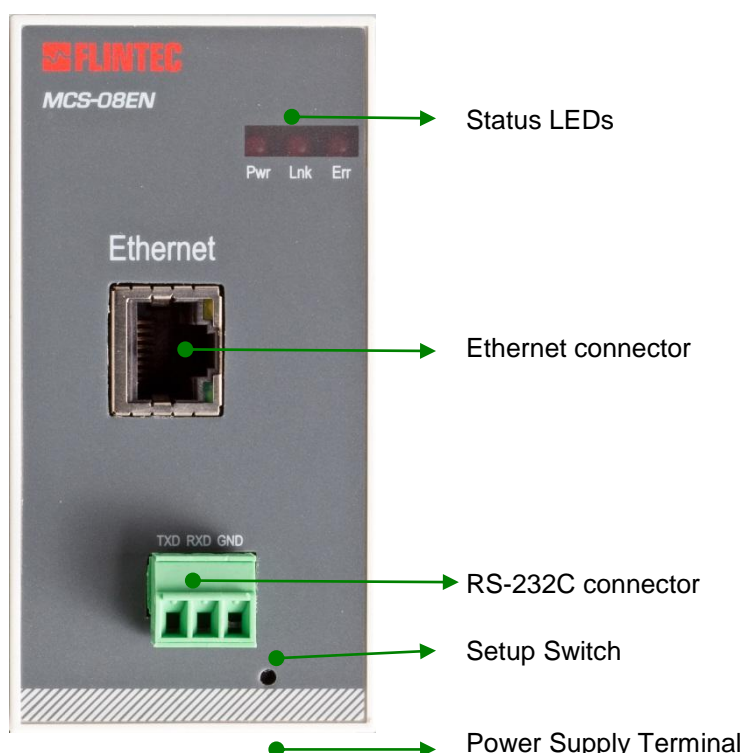


Figure 12.1 – Front view

The meanings of these LEDs in operation are described below.

Status LEDs		
Symbol	Name	Description
Pwr	Power	<div>●</div> Module is energized <div>○</div> Module is de-energized. Check power cable
Lnk	Link	<div>◐</div> Communication takes place <div>○</div> No communication
Err	Error	<div>●</div> Error. Refer to error table in chapter 14 <div>○</div> No error

○ Off ● On ◐ Off for 0.3 seconds

Table 12.1 – Status LEDs

12.2. Electrical Connections

Ethernet and RS-232C connections are shown in figure 12.2 to 12.4.

Ethernet Connector (RJ45)

Pin	Signal	DIR	Description
1	TX+	Out	Differential Ethernet transmit data +
2	TX-	Out	Differential Ethernet transmit data -
3	RX+	In	Differential Ethernet receive data +
6	RX-	In	Differential Ethernet receive data -
4	Not used		Terminated
5	Not used		Terminated
7	Not used		Terminated
8	Not used		Terminated
	Shield		Chassis ground

The HUB connection cabling will be a direct connection as shown below:

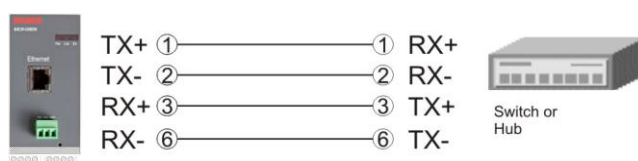


Figure 12.2 – HUB connection

The PC connection cabling will be done via cross cable as shown below:

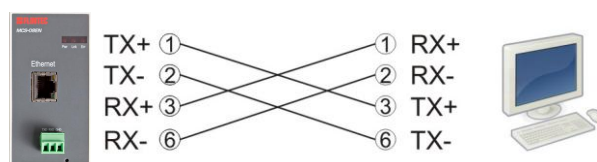


Figure 12.3 – Direct PC connection with cross cable

MCS-08EN interface connections are shown below:

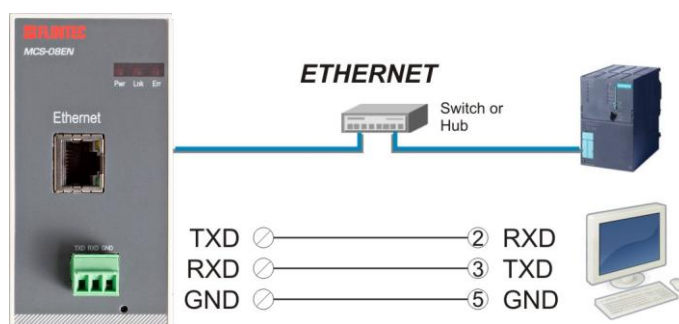


Figure 12.4 – MCS-08EN interface connections

RS-232C Serial Interface

Use	Setup via xFace
Baud rate	9600 bps
Length and parity	8 bit, no parity
Start / Stop bits	1 start bit and 1stop bit

Ethernet Interface

Use	Ethernet interface with PC or PLC
Data format	Modbus TCP/IP
Ethernet	The Ethernet interface operates at 10Mbit, half duplex

Warning: Connect the shield to the reference ground or shield pin of the power connector.

Warning: Disconnect xFace PC software for Ethernet interfacing.

Power Supply Connection

See chapter 4.2.1

12.3. N-Bus Addressing

MCS-08 modules communicate to each other over the internal N-bus. The MCS-08xx gateway module is the master of the internal N-bus. All other MCS-08 modules are slaves and have to be addressed to the gateway module. The N-bus addressing can be done by using the xFace PC software (refer to chapter 5.3) or via setup switch (refer to chapter 5.8).

12.4. Ethernet Setup

The Ethernet setup is done by the xFace software. Connect the gateway module with your PC via the RS-232C service port on the module as shown in figure 12.2 to 12.4. After connecting the xFace software with the gateway module select the Gateway tab. The Gateway tab is shown in figure 12.5. It displays all gateway information and TCP/IP Ethernet settings.

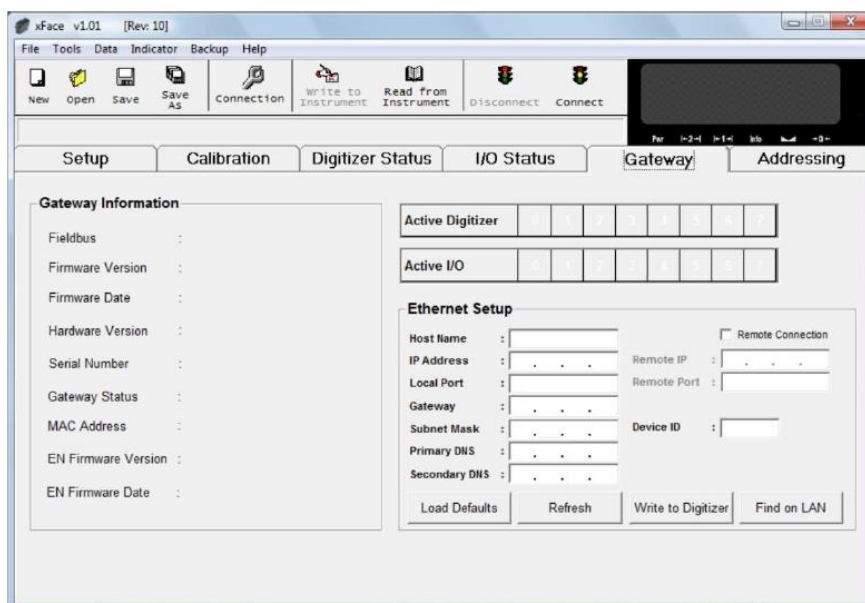


Figure 12.5 – MCS-08EN gateway setup

You will see the Ethernet setup in this tab.

Host Name	Device name of the instrument. Default is ' '.
IP Address	Define IP address manually. Default is '192.168.16.250'
Local Port	Ethernet connection port of the instrument. Default is '10001'.
Gateway	Network point that acts as an entrance to another networks. Default is '192.168.16.254'.
Subnet Mask	Defines IP addresses which can be used in network. Default is '255.255.255.0'.
Primary DNS	Define primary DNS manually. Default is '208.67.222.222'.
Secondary DNS	Define secondary DNS manually. Default is '208.67.220.220'.
Default password	"123456"

Displayed Gateway Information

External Bus: Ethernet (Modbus TCP/IP)

Firmware Version / PN Firmware Version: Revision number of the firmware

Firmware Date / PN Firmware Date: Release date of the firmware

Hardware Version: Revision number of the main printed circuit board

Serial Number: The module's serial number

Gateway Status: Indicates the system OK status






























MAC Address: The module's MAC address.

Modbus TCP Data Structure

The MCS-08EN gateway module can be used as a Modbus slave in a TCP/IP Ethernet network. Function codes '0x03' and '0x10' are supported. For the Modbus data structure please refer to chapter 5.11.

13. ERROR TABLE

The MCS-08 modules have been designed as very reliable and virtually error free instruments. However if an error occurs do not attempt to repair the equipment before you understand what caused the error. Note the problems you have with your instrument and the error messages shown by the LEDs located on the front panel. Then try to solve the problem according to the error tables given below.

Error Code			Description	Actions to undertake / Possible cause
		Err		
			ADC error	<ul style="list-style-type: none"> Re-energize the module Instrument could be defective
			Overload	<ul style="list-style-type: none"> Check the load on the affected MCS-08AD module Check the calibration of the affected MCS-08AD module
			Underrange	<ul style="list-style-type: none"> Load cell or module may be defective Re-energize the module. If seen again, replace the affected module
			ADC out	<ul style="list-style-type: none"> Check the load on the affected MCS-08AD module Check the calibration of the affected MCS-08AD module Load cell or module may be defective Re-energize the module. If seen again, replace the affected module
			System error	<ul style="list-style-type: none"> Re-energize the module. If seen again, replace the affected module
			Configuration error	<ul style="list-style-type: none"> Re-address the module on the N-Bus (Refer to chapter 5.3 or 5.8)
			N-bus communication error	<ul style="list-style-type: none"> Check the gateway module if it is in the system and energized Check the N-bus connectors if they are properly installed on the rail
			High voltage detected	<ul style="list-style-type: none"> Check the power supply if the voltage is within the required range
			Low voltage detected	













 Off  On  Flashing

Table 14.1 – Error table for MCS-08AD module

Error Code			Description	Actions to undertake / Possible cause
Pwr	Lnk	Err		
			System error	<ul style="list-style-type: none"> Re-energize the instrument. Module may be defective.
			Configuration error	<ul style="list-style-type: none"> Re-address the module on the N-Bus (Refer to chapter 5.3 or 5.8)
			N-bus communication error	<ul style="list-style-type: none"> Check the gateway module if it is in the system and energized Check the N-bus connectors if they are properly installed on the rail




 Off  On  Flashing

Table 14.2 – Error table for MCS-08IO and MCS-08 gateway modules

Message	Description	Actions to undertake / Possible cause
-----	N-bus communication error	<ul style="list-style-type: none"> Re-address the instruments on the N-Bus (Refer to chapter 5.3 or 5.8) Check the gateway module if it is in the system and energized Check the N-bus connectors if they are properly installed on the DIN-rail
PROG	Programming	<ul style="list-style-type: none"> MCS-08 is in setup mode
SYS	System error	<ul style="list-style-type: none"> Re-energize the module. If seen again, replace the affected module
ADC	ADC error	<ul style="list-style-type: none"> Check the load on the affected MCS-08AD module Check the calibration of the affected MCS-08AD module Load cell or module may be defective Re-energize the module. If seen again, replace the affected module
OVER	Overload	<ul style="list-style-type: none"> Check the load on the affected MCS-08AD module
UNDER	Underrange	<ul style="list-style-type: none"> Check the calibration of the affected MCS-08AD module Load cell or module may be defective



















Table 14.3 – Error messages for MCS-08DP modules

14. DIAGNOSTICS

In this test menu serial interface tests (RS-232C and/or RS-485) and load cell signal analog to digital conversion and processing tests can be initiated.

For entering the diagnostics mode, press the setup switch before power on and release the switch after the module is powered on.

A gateway module will go into the RS-232C RXD test mode which is indicated by lighted Pwr LED and flashed Err LED as shown below. The status of LEDs on the front panel indicate the test steps and the test result as described below. You can go to the next test by pressing the setup switch.

Test	LED Status			Description
	Pwr	Lnk	Err	
RS-232C RxD (for gateway modules only)				Pwr LED gets off 0.3 s after receiving any data. Press the setup switch to go to the next test step.
RS-232C TxD (for gateway modules only)				'A' to 'Z' characters are sent sequentially in 0.8 s intervals. If the same data is received, Pwr LED gets off for 0.3 s. Press the setup switch to go to the next test step.
RS-485 RD (for MCS-08MB only)				Pwr LED gets off for 0.3 s after receiving any data. Press the setup switch to go to the next step.
RS-485 TD (for MCS-08MB only)				'A' to 'Z' characters are sent sequentially in 0.8 s intervals. Press the setup switch to go to the next step.
Load cell signal (for MCS-08AD only)				→0← LED gets off while the load cell signal increases. Press the setup switch to go to the next step.
				↘ LED gets off while the load cell signal decreases.

 Off  On  Flash  Off for 0.3 second

Table 15.1 – Diagnostics

If you short circuit the RXD and TXD pins on the RS-232C port and start the TxD test, the receiving data is shown by the Pwr LED.

Press the setup switch for 5 seconds to exit the diagnostic mode and to return to normal operation mode.

15. FREQUENTLY ASKED QUESTIONS

Question	: My PC cannot communicate with the MCS-08 system. How can I check the COM port?
Answer	: – Connect the instrument to the PC and run Hyper Terminal. – Check the COM ports as described in chapter 12.
Question	: xFace installation needs to restart every time. How can I install it?
Answer	: – Read and follow the installation notes in the installation directory. – Update your computer (visit http://update.microsoft.com).
Question	: xFace cannot communicate with the MCS-08 system. What can I do?
Answer	: – Check the power, data cabling and LED status of the MCS-08 system – Check the PC port settings – Remove other connections – Re-energize the MCS-08 system and re-start the communication
Question	: My PC doesn't have any COM port. How can I connect it with the MCS-08 system?
Answer	: You can use a RS-232 / USB converter for serial interfacing via USB port. Select the COM port within the Connection Settings menu.
Question	: My PC has a COM port but I cannot see any COM port in the Connection Setting menu. How can I solve that problem?
Answer	: Another software may be connected to that COM port. Close all applications before you start xFace.
Question	: My PC cannot interface with the MCS-08 system. How can I check the COM ports?
Answer	: Short circuit the RXD and TXD pins of your COM port. Use any terminal software to check if the sent data will be received or not. You may also test the MCS-08 COM ports as described in chapter 12 by short circuiting the RXD and TXD terminals.
Question	: I need very fast communication. What is the response delay time of MCS-08?
Answer	: MCS-08 response delay is max. 4 ms for weight data.

Table 16.1 – FAQ

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